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THE TYPE WRITER.

In the month of July, 1867, we published an article describing a type writing machine, invented by a Mr. Pratt, of Alabama, which had then just been placed on exhibition in England. Referring to the subject of writing by mechanical means, we stated that "its manifest feasibility and advantage indicate that the laborious and unsatisfactory performance of the pen must sooner or later become obsolete for general purposes," and concluded our remarks with the suggestion that any one who should devise a practical machine of this nature would find before him a wide field and large demand for his invention.

It seems that the seed thus scattered broadcast through our columns has, in this instance, fallen upon fertile soil, for its fruit is now before us in the shape of a really practical typographer, accompanied by a letter from the inventor to the effect that his inspiration was derived from the idea advanced in these columns, and that he considers it due to our enterprise to inform us of the tendency of our labors.

The difficulty which everyone, heretofore attempting to construct apparatus of this nature, has encountered has been so to govern the types making the impressions on the sheet that the characters should follow each other in even lines and at proper intervals, in the same manner as the letters on a printed page. The ingenious manner in which this problem has been solved is shown in Fig. 2, which is a sectional view comprising the essential portion of the device. A is a lever or key from which a wire leads to the short arm of one of the type levers, B. These type levers, at the lower ends of which, C, the types are attached, are arranged in a circle, a section of which is shown in the engraving, so that when they are at rest they form a sort of pot, shaped like the frustum of a cone. D is an inked ribbon passing over rollers and extending between the paper rolled on the cylinder, E, and the type. A pressure on the knob of the lever, A, pulls down the wire, which, drawing down the short arm of one of the type levers, causes the end of the corresponding long arm to rise up and strike against the ribbon, thus leaving the impression of the type on the paper. As these levers are arranged in a circle, and their long arms made equal to the radius of the same, it is evident that the type ends of all will strike exactly at the center, so that if a piece of paper be immovably held directly over that point, the entire alphabet, punctuation marks, etc., may be printed one letter over another on precisely the same spot.

The remainder of the instrument consists of various ingenious devices for moving the paper so that the characters may be printed in proper succession. Referring to Fig. 1, the operator is seen sitting before a keyboard or assemblage of knobs, each of which is marked with a letter or punctuation mark, and each attached to one of the levers represented by A in Fig. 1. The paper is placed on an endless belt and then passes over the cylinder (E, Fig. 2), situated on the top of the box inclosing the lower portions of the machine. This cylinder rests in a frame on wheels, and is made to move bodily in the direction of its length by means of a weight.

We will now suppose that the operator begins to write. As she presses a key, it not only causes a type to fly up and leave its imprint on the paper, but, at the same time, it moves a rock shaft and dog, which, acting on a rack, permits the cylinder to be drawn, by the falling weight, a space equal to the proper distance between the letters in a word. The word being finished, the longer interval between it and the one following is obtained by pressing down the square frame extending beyond the keys in front, on which the left hand of the figure in our engraving is represented as resting. As soon as the cylinder has traveled the length of a line, it strikes a bell, thus notifying the operator of the fact. By pressing down the treadle under the machine, the cylinder is drawn back to its starting point, the weight raised ready to descend again, and at the same time a lever is moved which, acting on a ratchet wheel on the side of the cylinder, causes the latter to rotate on its own axis a sufficient distance to place the paper, which rests on its surface, in a position to receive the impression of another line.

By means of other ingenious attachments, which we have not room to describe, the spaces between letters, words, or parallel lines can be altered at pleasure. Words or sentences may be underscored whenever it is required to do so. The instrument permits two or more copies to be taken at once, as in manifold writing.

It requires no especial skill in its manipulation. A child knowing its letters may use it after an hour's instruction, and indeed any one, after short practice, can easily become able to write from sixty to eighty words per minute. The motion of the hand is free, easy, and unconstrained, so that the monotonous movement of the pen is avoided and the labor of writing performed with far less fatigue to the muscles of the hand and arm. The resistance of the keys to the fingers is not more than from four to five ounces—the same as that of the keys of a piano—while their movement under the hand is about five sixteenths of an inch.

The advantages gained by substituting plain letter press for manuscript are necessarily very important. It is well known that, notwithstanding the practice of a life time, barely a tithe of ordinary manuscript is universally legible, while an almost incalculable amount of time is wasted in telegraph, post, printing, and law offices in deciphering obscure handwriting. To authors who are but slow penmen, the rapidity with which their ideas can be put in permanent form by this machine will prove of the greatest assistance. Others, whose penmanship is of the Greeley order, an undistinguishable mass of hieroglyphics, will have the satisfaction of producing manuscript that can be read, while the work of both amanuensis and printer can be performed at one and at the same time.

The instrument, in its present practical form, was patented by Mr. C. L. Sholes, of Milwaukee, Wis., under date of October 29, 1871, applications, however, for other patents on further improvements being still pending.

Those of our readers desiring further information should call upon or address Messrs. Roudebush, Densmore & Co., No. 4 Hanover street, New York city.

SHOLES' TYPE WRITER.

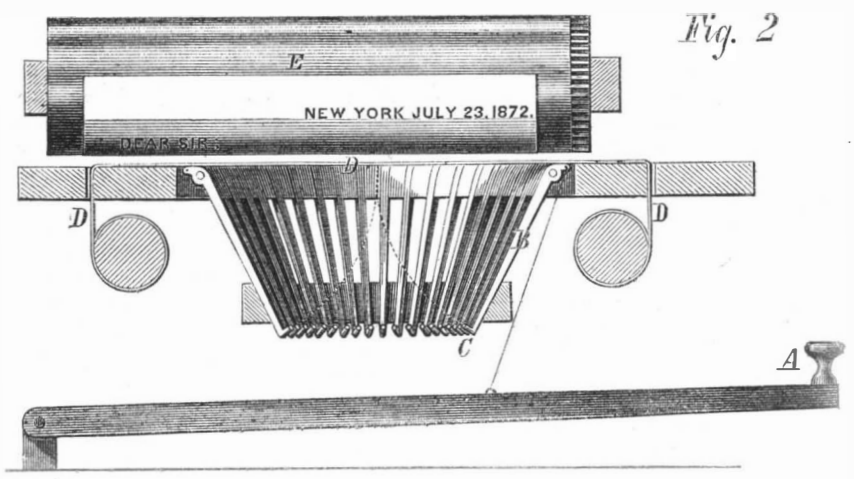

Fig. 2

ELECTRIC LIGHT.—The Alliance Company at Paris, are now manufacturing improved magneto-electric machines for the electric light. These are now made with four disks, and supply from 230 to 300 carcel jet burners, with a speed of 350 revolutions per minute, and driven by a 2½ horse power steam engine. The machines certainly seem expensive, costing £320 each; but it is estimated that thereby the combustion of a few pounds of charcoal gives an illuminating effect equal to that of 25 pounds of colza oil. This mode of illumination, therefore, is ultimately inexpensive, especially when applied on the large scale, for ships, large halls, lighthouses, etc., for which it is well adapted; and we shall, no doubt, soon hear of new applications of the invention.

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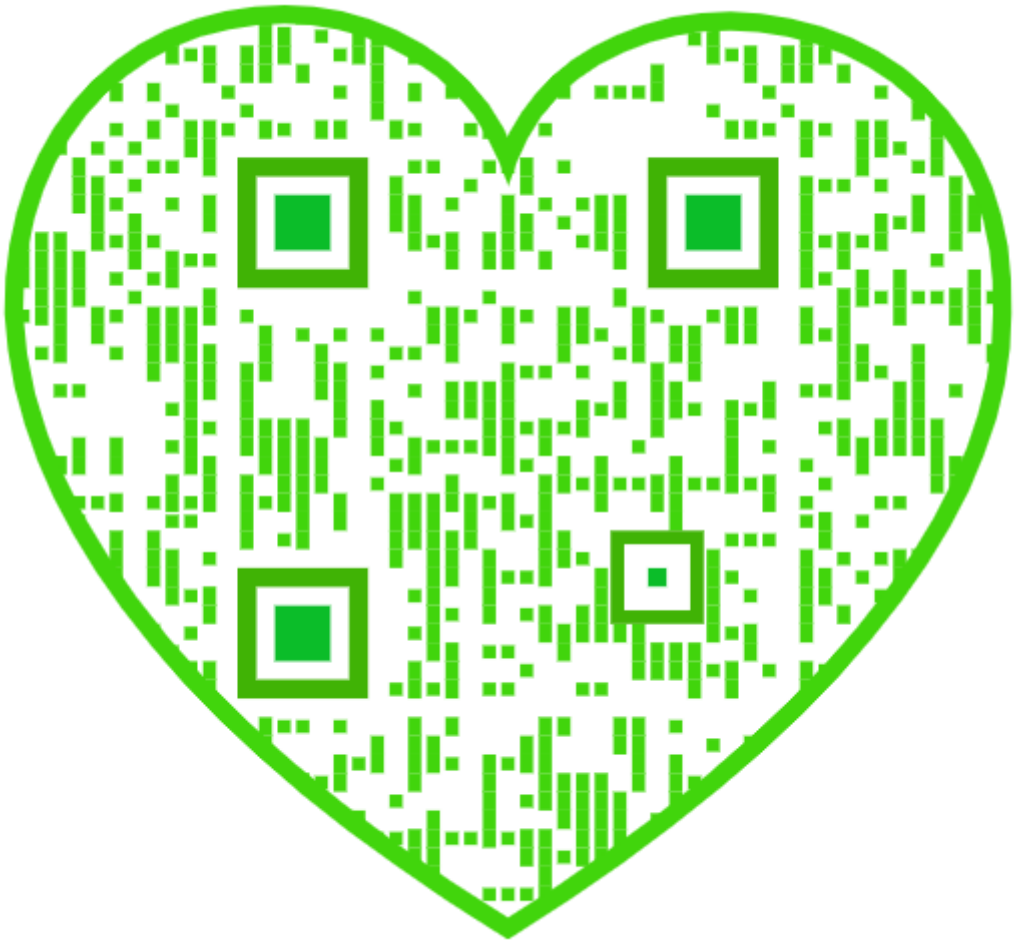

GLACIAL ACTION IN SOUTH AMERICA.

From Professor Agassiz's late report from the Hassler expedition to the Superintendent of the Coast Survey, we learn that his attention has been specially occupied with the glacial phenomena of the regions explored, and that his discoveries in this direction are of a most interesting character.

His observations, which extended along the coast of South America from Monte Video on the Atlantic side to Talcahuano on the Pacific coast, were more particularly directed to the situation and distribution of erratic pebbles and boulders, with the view of determining the agency by which they have been transported to their present resting places. It will be impossible in this article to follow our author step by step through all the very interesting details of his investigations, but, remarking that they have been most thoroughly pursued throughout, we will endeavor to give a brief general idea of their nature and results.

All over eastern Patagonia, including a portion of the straits of Magellan, are horizontal beds of tertiary formation which rise one above another. In consequence of disintegration, the harder beds form retreating shelves, like stairs, upon the slope of the shore, and wherever surface denudation has taken place, these shelves give rise to terraces which stretch, horizontally, at various hights all over the plains. The upper part of a cliff, situate at Cliff End in San Mathias Bay, which has not suffered denudation, was found to consist chiefly of sandy clay, with which alternate two distinct horizontal beds of considerable thickness formed entirely of pebbles. It is noteworthy that while these pebbles alternate thus in regular stratification in the upper part, they also form superficial deposits on the shelves below; and the Professor thinks that similar superficial deposits on such shelves elsewhere may have been mistaken by Darwin in some cases for indications of successive upheavals of the land. Here he sees no evidence of any upheaval, except one, which has taken place since the deposition of the tertiaries, and while shells found therein (now living) already existed; and still less does it appear to him that the country was submerged during the transposition of the erratics found here. Towards the west end of the bay, at San Antonio, where extensive denudations have taken place in the very formation just described, similar pebbles occur again; but, instead of being in well defined beds above the sea level, they exist as shore pebbles, which cover, in a deep layer, the entire beach. Their position here shows, beyond doubt, that the set of beds above which they rest at Cliff End has been broken down and recently removed by the action of the sea, and the pebbles themselves thus brought down to the beach. It follows from this that they could not have been ground to their present shape upon the modern beach, but that they must have undergone that process upon an older foundation which corresponded at the time to the level of their beds at Cliff End.

From these facts, and from subsequent observations relative thereto made further south, the inference is drawn that these pebbles must have passed through the mill of a glacier's bottom before they were worked up by the floods into their present position; and there is no reason why the floods which denuded the shelves could not as well have been caused by melted ice at the close of the glacial period, as by a change of level between land and sea.

In Possession Bay, in the Straits of Magellan, was found, about a mile from the shore bluff and nearly 150 feet above the sea level, a salt pool, in which marine shells identical with those now living along the shore were abundant. They were perfectly preserved and many of them were alive. In this was evidence of a very recent upheaval, and a confirmation of Darwin's assertions of recent occurrences of a like nature on this shore. Upon further exploration, upon a tertiary terrace a little above the salt pool was found a distinct moraine (that is, a ridge of boulder-shaped stones always found at the foot of a glacier) in which scratched pebbles were mingled with rounded ones in as large a proportion as occurs in any moraine found fronting an existing glacier. Higher up, also, erratics were scattered over the plain, and at the highest elevation, 400 feet above tide water, a number of large, angular boulders were seen. The existence of this pool and moraine, in close proximity, is considered a fact of great significance. That no gradual upheaval has occurred is proved by the ground, which consists of tertiary beds without a trace of shore pebbles. Darwin was led to believe that the drift was scattered over Patagonia by icebergs while the country was submerged; but the presence here of this moraine shows that the upheaval must have occurred before the dispersion of the drift, and not after.

Many and almost exact similarities were remarked between the Patagonia and Alpine scenery, and the surface features of the straits were found to have much the same aspect as the glaciated surfaces of the northern hemisphere, while from the higher mountains of the Andes glaciers were seen, depending to the sea level, which may fairly be compared with the most impressive glaciers of the Alps. In many places the glacial marks were as plain as in the valleys of Switzerland, and the abrasion by ice was uniform, general and unmistakable. The grand general movement appears to have been from the south, northward; and the direction is such that glaciers from the adjoining mountains cannot be supposed to have caused the abrasions and furrows of the rocks.

All the erratic stones found in the entire survey possess the same character, and their geological identity is further shown by the presence of a certain very hard, compact rock which is never absent from them, and yet never found in place, so far as known, over the whole extent of country examined. Their present position therefore cannot have been due to the enlargement of the existing glaciers, as in that case the drift would consist mainly of the rocks in place and would differ according to locality. This distinctive nature of the drift led our author from the first to discriminate between the phenomena connected with the local glaciers and those belonging to what he designates the glacial period. To this period he refers a great part of the phenomena witnessed by him, and which he looks upon as palpable evidence that a prodigious mantle of ice was once spread over the southern part of this continent; and he further believes that future investigation will bring to light conclusive evidence of a southern circumpolar glacial agency.

Recent Astronomical Discoveries.

Dr. Huggins has communicated to the Royal Society a series of results of extreme interest, obtained by means of the fine telescope placed at his disposal by the Royal Society.

His work, according to the *Mechanics' Magazine*, has been divided into two main portions. First, he has been engaged in comparing one of the bright spectral lines of the gaseous nebulæ with the corresponding line in the spectrum of nitrogen. This line, as seen in the latter spectrum, is double. When using his own 8 inch telescope, Dr. Huggins was unable to determine whether the nebula line was double or not. He could not use sufficient dispersive power. He has now obtained definite results on this point, so far at least as the Orion nebula is concerned. In the spectrum of nitrogen, the components of this double line are rather broad and nebulous. In the spectrum of the Orion nebula, there is one line, narrow and well defined, which agrees in position with the less refrangible of the nitrogen pair.

It is possible, however, Dr. Huggins remarks, that this line in the spectrum of the gaseous nebulæ is not due to nitrogen at all; or else, one line of nitrogen fades out altogether.

The second series of results obtained by Dr. Huggins is more definite and important. It relates to the determination of the stellar motions of recession or approach.

Dr. Huggins had judged, when he used his 8 inch telescope, that Sirius is receding at the rate of about 25 miles per second. He now finds, with a telescope fifteen feet long, that the rate of recession is somewhat less, lying probably between 18 and 22 miles per second.

He has now been able to extend this method to several other stars. He finds evidence in favor of a general tendency to recession in stars occupying that part of the heavens from which our sun is known to be traveling; while on the opposite side of the heavens the stars seem in general to be approaching. But the rates of recession and approach accord very ill with the usually adopted value of the solar proper motion, and appear to support the theory, recently advanced, that the estimates of the stellar distances, on which that value has been based, are not trustworthy. We know that the sun's rate of motion has been set at five or six miles per second, and such a rate of motion could only account for a general excess of recession in stars lying in one direction, and of approach in stars lying in the opposite, by about the same amount. But Dr. Huggins finds motions of recession of from 15 to 40 miles per second, and motions of approach amounting even to the enormous rate of nearly 50 miles per second, in the case of Arcturus. It follows from this that Struve's estimate of the average distances of the brighter stars is altogether too low.

But even more interesting than this result, is Dr. Huggins's recognition of a community of motion in certain sets of stars.

It was to precisely such community of motion that Mr. Proctor invited attention in the paper on star drift, read before the Royal Society on January 20, 1870; and he expressed then, and has since repeatedly expressed, his conviction that whenever Dr. Huggins applied to certain stars the spectroscopic method of determining motions of recession or approach, he would find that they are either all receding or all approaching, and at the same rate.

This prediction has been fulfilled to the letter. Dr. Huggins finds that these stars are all receding at the rate of about 30 miles per second.

It is evident that Dr. Huggins' method of research promises results of exceeding interest and throwing a new light on the structure of the sidereal universe. He has now placed beyond question what Mr. Proctor has long maintained—the theory, namely, that within the stellar system there exist subordinate systems, surrounded by regions relatively barren. These systems of stars speed on their course, possessing a community of motion within the great star system, though within these subordinate systems themselves every variety of motion may subsist. It is wonderful, indeed, to consider the consequences which flow from this discovery. The whole aspect of the sidereal universe is changed by it. All theories which have so long done service in our text books of astronomy go by the board. We see that there is a complexity of detail within the stellar universe and a variety of aggregation, of structure, of motion, of interdependence, and finally, an exuberance of vitality, such as until the last two or three years had not been recognized by astronomers.

Compressed Gun Cotton.

Great benefits in point of economy and efficiency are derived from the new system of reducing the gun cotton fiber to pulp, and converting it by powerful compression into compact homogeneous masses. Important consequences of the large reduction in the space occupied by gun cotton, when used in this compressed form, were the very considerable increase in the amount of tamping which could be used in blast holes, and the greater concentration of the force applied; the destructive effects in hard rock were consequently much augmented, and the cool blast should be placed farther apart and reduced in dimensions. Large charges of compressed gun cotton occupied so much less space than the rope charges, and were so considerably lighter than powder charges, that the material became specially valuable for submarine operations. Other peculiar advantages were presented by the compressed material; thus, its cost of production was greatly reduced, because cotton waste could be employed in its manufacture, and because its conversion into the required forms required comparatively little time: its purification was more complete, as the finely divided fiber was much more readily washed than the long fiber required for furnishing rope charges; and its uniformity was much greater, because the products of a large number of successive small operations were intimately blended together in the pulping and washing processes.

When carried into the field for military purposes, compressed gun cotton is very decidedly safer than nitro-glycerin preparations; because if carts or packages containing the latter are fired into from accident or design with ordinary small arm bullets, their contents will be violently exploded as by detonation, while the gun cotton under the same circumstances would be simply inflamed.

Although gun cotton and nitro-glycerin mixtures possess very important advantages over gunpowder, in all applications where suddenness and violence of action are desirable, there are some directions in which they do not possess superiority over powder, and others in which they cannot replace it, irrespectively of its applications to projectile purposes. In soft rock, in earth mines, and in some blasting operations, where it is desired to displace large masses of earth, rock, or stone, the gradual action of gunpowder gives it decided superiority.

The degree of safety with which explosive agents may be manufactured is an important question connected with their extensive application. The fact that the manufacture of gun cotton as now carried on involves not the slightest risk of explosion up to the final stage, when the material has to be dried, distinguishes it from most other explosive agents. In gunpowder manufacture, liability to explosion exists throughout all operations from the point when the ingredients are mixed, and with regard to nitro-glycerin it appears that up to the present time occasional severe accidents during manufacture have been inevitable. The immunity enjoyed by gun cotton is due to its being wet, and therefore absolutely uninflammable, throughout all stages, even after it has been compressed into cakes or disks. At this point it contains 15 per cent of water, the expulsion of which by desiccation is unattended by any liability to explosion, or even to ignition if very simple precautions are adopted. For storing large quantities with absolute safety, it is very convenient to preserve the compressed gun cotton damp, as it is delivered from the presses. It has been thus stored for very long periods without the slightest detriment, and its non-inflammability in this condition is aptly illustrated by the fact that the perforations required in some of the charges are produced by drilling the damp gun cotton, the drill revolving at the rate of about 600 revolutions per minute. The gun cotton employed in some extensive experiments recently made had been stored damp for nearly nine months, and was dried partly in the open air and partly in a hot air chamber, when required for use. On that occasion, says the *Mechanics' Magazine*, six cwt. of damp gun cotton, packed in 24 strong wooden boxes, were stacked in a wooden shed and surrounded by inflammable material. The building was then fired, and soon burned fiercely, which it continued to do for about half an hour, when the fire gradually subsided, and the building and its contents were entirely consumed. The gun cotton must have slowly burned away as the surfaces of the masses became sufficiently dry, but at no period of the experiment was there even any burst of flame, due to rapid ignition, perceptible.

Narrow Gage in Japan.

After three years' labor, the Japanese have succeeded in building one railroad for a distance of thirteen miles. The line was intended to connect Yokohama and Jeddo, these cities being seventeen and a half miles apart; but public travel has already begun upon it, in spite of its unfinished condition.

The road has but a single track of three feet six inches gage, and yet has cost nearly $120,000 per mile. Unless, as is most probably the case, there is an immense lack of engineering talent in the country, it is difficult to find an explanation for this state of facts. Labor is abundant and cheap; money and material are plentiful, and the construction of the line has been retarded by no physical difficulties.

The correspondent of the New York *Herald* states that even the completed portion of the route is but poorly built, notwithstanding its great cost. There are first, second, and third class cars. Those of the lowest class look like diminutive cattle cars with wooden benches in them, while those of the other classes resemble ordinary street cars, only they are narrower and in every way smaller. The first class cars are divided into three compartments by sliding doors, and carry twelve persons comfortably. The second class cars differ from the first by not being subdivided, and by being furnished with cane seats instead of leather ones.

The highest speed attained is about twenty-two miles per hour. Officials abound, there being two to each car. The road, in spite of all its shortcomings, is rapidly making money, having averaged since its opening some $500 per day. The rates of fare are absurdly high (1st class, $1·50; 2d class, $1; 3d class, 50 cents); but these, it is stated, will soon be reduced.

THE great bridge across the Mississippi at St. Louis, Mo., is almost done. It is to be finished during the present month of August.

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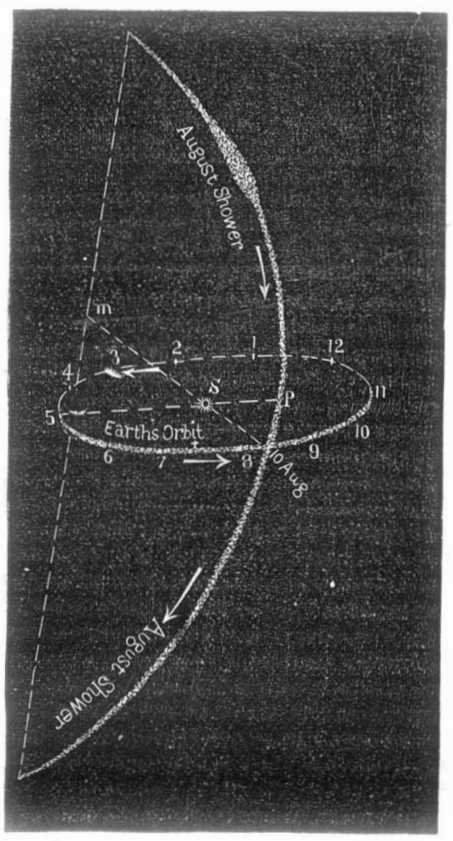
THE ANNUAL AUGUST SHOWER OF METEORS.

It is now generally received and placed almost beyond doubt, by the recent observations of Schiaparelli, Le Verrier, Weiss, and others, that meteors, for the most part small but weighing occasionally many tuns, are fragmentary masses, revolving, like the planets, round the sun, which in their course approach the earth, and, drawn by its attraction into our atmosphere, are set on fire by the heat generated through the resistance offered by the compressed air.

Their chief constituent is metallic iron, mixed with various silicious compounds; in combination with iron, nickel is always found, and sometimes also cobalt, copper, tin, and chromium.

The hight at which meteors appear is very various, and ranges chiefly between the limits of 46 and 92 miles; the mean may be taken at 66 miles. The speed at which they travel is also various, generally about half as fast again as that of the earth's motion round the sun, or about 26 miles in a second; the maximum and minimum differ greatly from this amount, the velocity of some meteors being estimated at 14 miles, and that of others at 107 miles in a second.



When a dark meteorite of this kind, having a velocity of 1,660 miles per minute, encounters the earth, flying through space at a mean rate of 1,140 miles per minute, and when through the earth's attraction its velocity is further increased 230 miles per minute, this body meets with such a degree of resistance, even in the highest and most rarefied state of our atmosphere, that it is impeded in its course, and loses in a very short time a considerable part of its momentum. By this encounter there follows a phenomenon, which always takes place when the motion of a body is interrupted, designated by the expression "the conversion of the motion of the mass into molecular action or heat;" it is a law without exception that, where the external motion of the mass is diminished, an inner action among its particles, or heat, is set up in its place as an equivalent, and it may be easily supposed that, even in the highest and most rarefied strata of the earth's atmosphere, the velocity of the meteorite would be rapidly diminished by its opposing action, so that shortly after entering our atmosphere the vibration of the inner particles would become accelerated to such a degree as to raise them to a white heat, when they would either become partially fused, or, if the meteorite were sufficiently small, it would be dissipated into vapor, and leave a luminous track behind it of glowing vapors.

As this heat originates form the motion of the meteor being impeded or interrupted by the resistance of the air, and as this motion or momentum is exclusively dependent on the speed of the meteor as well as upon its mass, it is possible, when the rate of motion has been ascertained by direct observation, to determine the mass. Professor Alexander Herschel has calculated by this means that those meteors of the 9th and 10th of August, 1863, which equaled the brilliancy of Venus and Jupiter, must have possessed a mass of from five to eight pounds, while those which were only as bright as stars of the second or third magnitude would not be more than about ninety grains in weight. As the greater number of meteors are less bright than stars of the second magnitude, the faint meteors must weigh only a few grains, for, according to Professor Herschel's computation, the five meteors observed on the 12th of November, 1865, some of which surpassed in brilliancy stars of the first magnitude, had not an average weight of more than five grains; and Schiaparelli estimated, from other phenomena, the weight of a meteor to be about fifteen grains. The mass, however, of the meteoric stones which fall to the earth is considerably greater, whether they consist of one single piece, such as the celebrated iron-stone discovered by Pallas in Siberia, which weighed about 2,000 pounds, or of a cloud composed of many small bodies which enter the earth's atmosphere in parallel paths, as shown in the engraving and which, from a simultaneous ignition and descent upon the earth, present the appearance of a large meteor bursting into several smaller pieces. Such a shower of stones, accompanied by a bright light and loud explosion, occurred at L'Aigle, in Normandy, on the 26th of April, 1803, when the number of stones found in a space of 14 square miles exceeded 2,000. In the meteoric shower that fell at Kúyahinga, in Hungary, on the 9th of June, 1866, the principal stone weighed about 800 pounds, and was accompanied by about a thousand smaller stones, which were strewn over an area of 9 miles in length by 3¼ broad.

The meteor shower of the 10th of August, the radiant point of which is situated in the constellation *Perseus* takes place nearly every year, with varying splendor; we may therefore conclude that the small meteors composing this group form a ring round the sun, and the earth every 10th of August is at the spot where this ring intersects our orbit, also that the ring of meteors is not equally dense in all parts; here and there these small bodies must be very thinly scattered, and in some places even altogether wanting.

The diagram shows a very small part of the elliptic orbit which this meteoric mass describes round the sun, S. The earth encounters this orbit on the 10th of August, and goes straight through the ring of meteors which ignite in our atmosphere, and are visible as shooting stars. The line, *m*, is the line of intersection of the earth's orbit and that of the meteors; the line, P S, shows the direction of the major axis of their orbit. This axis is fifty times greater than the mean diameter of the earth's orbit; the orbit of the meteors is inclined to that of the earth at an angle of 64° 3′, and their motion is retrograde, or contrary to that of the earth.

The November shower is not observed to take place every year on the 12th or 13th of that month, but it is found that every 32 years an extraordinary shower occurs on those days, proceeding from a point in the constellation *Leo*. The meteors composing this shower, unlike the August one, are not distributed along the whole course of their orbit, so as to form a ring entirely filled with meteoric particles, but constitute a dense cloud, of an elongated form, which completes its revolution round the sun in 33 years, and crosses the earth's path at that point where the earth is every 13th of November.

Schiaparelli shows in a striking manner that, as a comet is not a solid mass but consists of particles, each possessing an independent motion, the head or nucleus nearer the sun must necessarily complete its orbit in less time than the more distant portions of the tail. The tail will therefore lag behind the nucleus in the course of the comet's revolution, and the comet, being more and more elongated, will at last be either partially or entirely resolved into a ring of meteors. In this way the whole path of the comet becomes strewn with portions of its mass, with those small, dark, meteoric bodies which, when penetrating the earth's atmosphere, become luminous, and appear as falling stars.

Schiaparelli has, in fact, discovered so close a resemblance between the path of the August meteors and that of the comet of 1863, No. III, that there cannot be any doubt as to their complete identity. The meteors to which we owe the annual display of falling stars on the 10th of August are not distributed equally along the whole course of their orbit; it is still possible to distinguish the agglomeration, of meteoric particles which originally formed the cometary nucleus, from the other less dense parts of the comet; thus, in the year 1862, the denser portion of this ring of meteors through which the earth passes annually on the 10th of August, and which causes the display of falling stars, was seen in the form of a comet, with head and tail as the densest parts, approaching the sun and earth in the course of that month. The difference between the comet's nucleus and its tail that has now been formed into a ring consists in that, while the denser meteoric mass forming the head approaches so near the earth once in every 120 years as to be visible in the reflected light of the sun, the more widely scattered portion of the tail composing the ring remains invisible, even though the earth passes through it annually on the 10th of August. Only fragments of this ring, composed of dark meteoric particles, become visible as shooting stars when they penetrate our atmosphere by the attraction of the earth, and ignite by the compression of the air.

Calculation shows that this ring of meteors is about 10,948 millions of miles in its greatest diameter. As the meteoric shower of the 10th of August lasts about six hours, and the earth travels at the rate of eighteen miles in a second, it follows that the breadth of this ring, at the place where it crosses it, is 4,043,350 miles.—*Dr. H. Schellen, in Spectrum Analysis.*

Steam Power in Carriage Building.

In New York city, only four carriage factories employ steam power for running machinery; and we have good reasons for believing that it pays the proprietors well—indeed so well that they would not dispense with it for many times the cost of the investment. Now, as it pays well in these four factories, why would it not pay in all other large factories?

A ten horse engine, with boiler and the following most common machinery: a cross cut saw, a rip saw, a band saw, a planer, a mortising machine, and a shaper, or variety molding machine, will cost, with shafts and belting, all up and ready for use, about $5,000; and the daily expenses, including fuel, engineer's wages, oil, etc., about $5. Now, what benefit would be derived therefrom? Every wood worker spends, we have been told, about one eighth of his time daily by such sawing as could be done by machine saws in less than ten minutes. By the shaping machine, it is but fair to estimate a similar saving of time; and the planer and mortiser would, we think, average more. Where a dozen mechanics are working, the said machinery will give a saving of three hours per man, or equal to three tenths of their wages, in the aggregate about $15 per day. We think that the saving would be far greater under an efficient foreman, which the system requires, as he can systematize the work so that he gives each workman the materials after they have been cut, shaped, and dressed by the machinery, and are nearly ready for connecting and finishing. If the foreman is unused to machinery, it will, of course, take him some time to use it expeditiously; but if he is a smart man, which a foreman always ought to be, he will soon master the difficulties. Experience has taught us that it is best from the start to hire a man used to run wood working machinery, as thereby a saving in time and expenses is immediately effected; while in the absence of a skillful machine hand, the erection of machinery driven by steam power generally results in a loss of money and materials the first year.

Of course wood working machinery pays best where several sets of work of the same shape are made. It needs not much penetration to understand that a dozen carriage bodies of one pattern can, by help of machinery, be made as cheaply as three bodies of different patterns. Nevertheless, we believe that, even in those shops where every carriage body has a shape of its own, wood working machinery will pay. The saws, for instance, are always handy assistants, no matter what work the maker is building.

In the smith shop, steam power is useful and labor-saving in a thousand ways. The old fashioned bellows may be discarded, trip hammers erected, and almost one half of the hands dispensed with.

In the paint shop and varnish room, steam can always be used advantageously, as thereby a uniform temperature, so desirable for their work, may be maintained.

Even in a trimming shop, steam power can be made available, for moving machinery, for cutting leather, skin, buckram, etc., and for driving sewing machines and other machinery. In fact, any establishment which has commenced to use steam power will soon learn that it is a general benefactor. The grindstones will always turn at a single movement of the hand, superior glueing, bending and veneering apparatus are within command, and a general elevation is always discernible where the steam engine is running. The constant movement around the mechanic awakens his speculative faculties. His mind will be turned in a direction that will gradually develop his mechanical ideas; and the result will be new mechanical devices, which will execute a certain amount of labor, stimulate him to greater achievements, and be a great use and benefit to him.

All mechanics cannot be Watts, Fultons, Morses, or Howes, but all should aim to be, and the more familiar they are with labor-saving machinery, the sooner will their latent genius come forth.—*The Hub.*

Use of Fruit.

Instead of standing in fear of a generous consumption of ripe fruit, one should regard it as decidedly conducive to health. The very diseases, says the *Country Gentleman*, commonly assumed to have their origin in the free use of all kinds of berries, apples, peaches, cherries, pears, and melons, have been quite as prevalent, if not equally destructive, in seasons of scarcity. There are so many erroneous notions entertained of the bad effect of fruit that it is quite time a counteracting impression should be promulgated, having its foundation in common sense and based on the common observation of the intelligent. No one ever lived longer, or freer from the attacks of disease, by discarding the delicious fruits of our country. On the contrary, they are very essential to the preservation of health, and are therefore given to us at the time when the condition of the body, operated upon by deteriorating causes not always comprehended, requires their grateful, renovating influences. Unripe fruit may cause illness, but fresh, ripe fruit is always healthful.

New Photographic Method.

M. Fargier, whom the editor of the *Moniteur* tells us was the first to render carbon printing practicable, is again in the field with a new carbon process. Some specimens were exhibited, and the following details communicated, at the last meeting of the French Photographic Society. The method seems to possess considerable novelty and interest. It is as follows:

A certain saline solution, the nature of which is for the present a secret, is prepared and put into a dish. Upon this bath a common sheet of paper is floated, then dried and exposed to light under a negative. The image comes out by degrees, and you can watch its progress. When sufficiently printed, this image is laid upon a bath of blackened gelatin, like that which is used for the preparation of pigment papers. The pigment only attaches itself to those parts which have been acted on by light. The paper is then washed in warm water, and the print is finished.

Channel Railway Ferry.

The Parliamentary Committee has rejected the bill authorizing the construction of a new channel railway ferry between France and England. At present passengers are carried across the English Channel, 29 miles, in small steamers not so large as some of our river ferry boats.

Mr. John Fowler, C. E., Engineer of the London Underground Railways, is the projector of the new channel ferry, and his scheme involves the employment of large steamers, 450 feet in length, on which the passenger cars are to be carried across. A train of sixteen cars containing 336 passengers is to be carried, the cars being raised from and lowered to the decks fo the steamers by hydraulic elevators.

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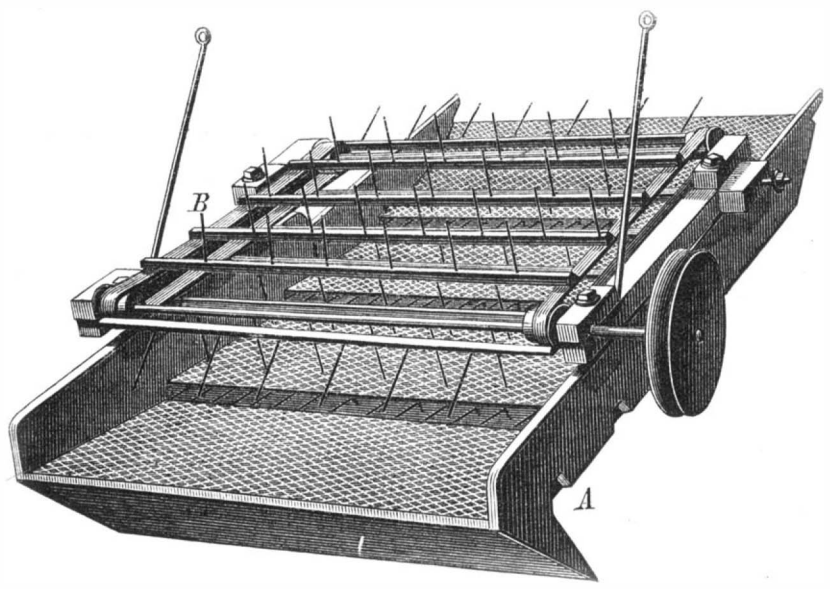
IMPROVED SEED CLEANER FOR THRASHERS.

The invention now illustrated is an improved apparatus for cleaning timothy and other grass seeds, which can readily be attached to the thrashers and separators in ordinary use. Our engraving shows the riddle and chain of rakes which compose the improvement, unattached to the machine. The side boards of the riddle, A, are notched and made of a shape suitable to fit on to the shoe of the thrasher, to which they are secured by screws or bolts. The riddle shown is provided with four screen plates, which are perforated so as to allow the blast to pass upward and the seeds downward through the perforations. They are made with steps between them, the uprights of which are pierced with numerous holes, above which teeth are arranged so as to carry the stalks, etc., on to the next plate and at the same time allow the blast to operate upon them properly as they are passing from one plate to the other. The carrier or stirrer, B, consists of the endless belts shown, which pass round pulleys attached to shafts at the ends of its framework, and to which are attached toothed crossbars. The rear shaft revolves in bearings which are firmly connected with the frame of the thrasher in such a position as to bring the rear end of the carrier over the forward end of the last plate in the riddle. The forward shaft runs in adjustable bearings secured by screws, by means of which the tension in the belts is regulated. The carrier is driven by a belt connection with the operating mechanism of the straw stacker. The teeth attached to the crossbars are of sufficient length to reach nearly to the screw plates of the riddle, and the belts and teeth are arranged so that the sides of the riddle do not strike against them as the shoe of the thrasher is vibrated.



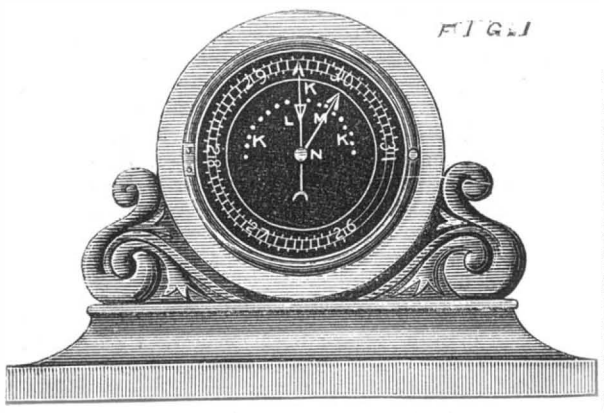
CUSTER'S SEED CLEANER FOR THRASHERS.

By the construction described, the motion communicated to the teeth of the carrier causes them to carry backward the chaff, stalks, etc., while they and the seed are being moved from side to side by the vibration of the shoe and riddle. The seed which falls through the three forward plates of the riddle passes down through the machine to the floor or grain box. That which passes through the rear plate is received by a spout and carried back to the thrasher.

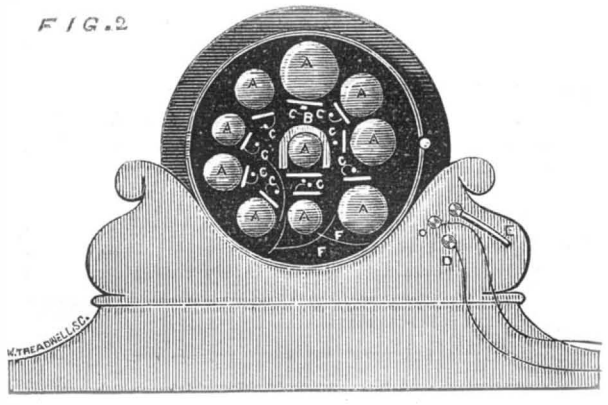
The improvement is the invention of Mr. John L. Custer, of Bonaparte, Van Buren Co., Iowa, from whom further information on the subject may be obtained. Patented through the Scientific American Patent Agency, May 14, 1872.

A MUSICAL BAROMETER.

A very interesting and useful application of the electromotive force is seen in the musical barometer, invented by Captain Hans Busk, and patented in England. Within the case of an ordinary aneroid barometer, he arranges a series of



musical bells, of different tones, having hammers that are operated by electro-magnetic agency, the magnets of the hammers being brought into the battery circuit, and so made to strike, by means of the usual indicating pointer on the



face of the barometer. To effect this closing of the circuit the face of the barometer is provided with a series of platinum conducting pins, and whenever, by a change in the atmospheric conditions, the pointer is moved it touches a corresponding pin, and the bell that is in connection with such pin is sounded.

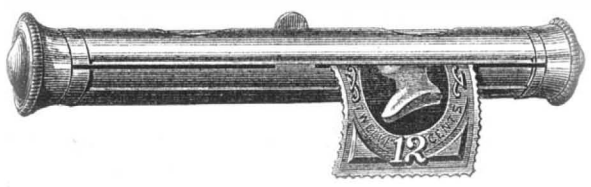
The general construction will be readily understood by a glance at our engravings, in which Fig. 1 shows the front of the barometer, and Fig. 2 the back thereof, exhibiting the bells and their magnets. All the bells have a different note. It is therefore easy to tell, even at a distance, whether the barometer is rising or falling. The deeper toned bell gives notice when the barometer falls from 29 50 inches down to 28, while the higher notes indicate a rise towards 31 inches. In variable and unsettled weather, more especially at sea, it is curious to note the rapidity with which these changes occasionally succeed each other.

Imported Sailors---Shall we Abolish the American Service?

It is a suggestive fact that the new American Steamship Company of Philadelphia think of going abroad for seamen to man their vessels. A comparison of English and American wages per month for seamen shows that, in the case of one of the new Philadelphia steamers, the annual difference in wages in favor of a competing English steamer of the first class will amount to about $25,000, or six per cent on the cost of construction. A first class English engineer gets, according to the current rates, $80 per month, while an American engineer asks $240 per month. An English fireman works for $20 per month, and an American fireman wants $40 per month; an English ordinary seaman has $12.50 per month; an American seaman, $40. Of course, no good American sailor could be tempted to work for less pay than sailor receives, and consequently the owners of American shipping seek the cheapest help they can get. The item of wages, in the case of the Philadelphia company, is one demanding serious consideration. If, as the New York *Bulletin* says, an American steamer be manned with American seamen at current wages, her annual expenses would be greater than those of an English steamer with a crew of the same size, and to build a ship at home and send abroad for a crew to man it is, so far as we know, without precedent in maratime history. If we are ever to have ships, we must have sailors of our own to navigate them; and how can we have sailors of our own if the seamen's labor market is to be perpetually depressed by unrestricted foreign, competition? Philadelphia is a strong "protective" city, and it would not look very well for the owners of the new steamship line to import its sailors.

POSTAGE STAMP HOLDER.

Every one has experienced the difficulty of carrying postage stamps about the person. If kept in the vest pocket or even in a portemonnaie, the warmth of the body is sufficient to make them adhere to their receptacle, thus rendering them



liable to be torn or defaced. Their small size also makes them easily lost or mislaid among the papers of a writing desk, so that there has been an actual need for some invention which, while retaining the stamps safely, should always present them in a convenient manner ready for use.

These requirements it is aimed to fulfil in the neat little device represented in the accompanying illustration. It consists of a small cylinder of metal in which the stamps, after being rolled up, are placed, the ends of the rolls projecting through slots cut in the side of the cylinder. These slots are covered by a sliding cover, which is kept in position by means of a spiral spring. This cover is represented in the engraving as drawn back. The ends of the cylinder are closed by two small caps which are readily removed when necessary.

The end of a roll of stamps, after the latter is placed in ths cylinder, is drawn out through one of the slots until the perforated portion, attaching a stamp to the roll, is held between the edge of the sliding cover, when closed, and a shoulder extending along the length of the cylinder. The stamp is then readily torn off. If now the cover be pushed back, the end of another stamp will be found protruding from the slot ready to be drawn out when required. The cylinder is made in two compartments, each pierced with a slot, so that stamps of two denominations may be carried.

The holder is small, may be easily carried in the vest pocket, and is, besides, a convenient addition to the writing desk. It can be made, if required, of sufficient size to contain tickets or similar small articles. Address, for further information, Mr. H. V. Dempster, 1,014 E street, Washington, D. C.

THE PATENT OFFICE GAZETTE.

The *Official Gazette* of the Patent Office is furnished at the government expense to Senators and Representatives in Congress; each of these persons may designate eight public libraries to which the *Gazette* shall also be sent free. All others who desire to receive the publication must subscribe. The rate is to be not less than five dollars a year, which is the price at present. The Commissioner of Patents may, we presume, increase the price should he deem it necessary. The publication of the drawings of the patents for the current year on a reduced scale has been commenced in the *Gazette*. They are admirably executed by the American Photo-Lithographic Company. The drawings are given in full, but such is the perfection of the reductions that, although the drawings of no less than thirty patents are in some cases presented on a single page of the *Gazette*, every drawing is clear and legible.

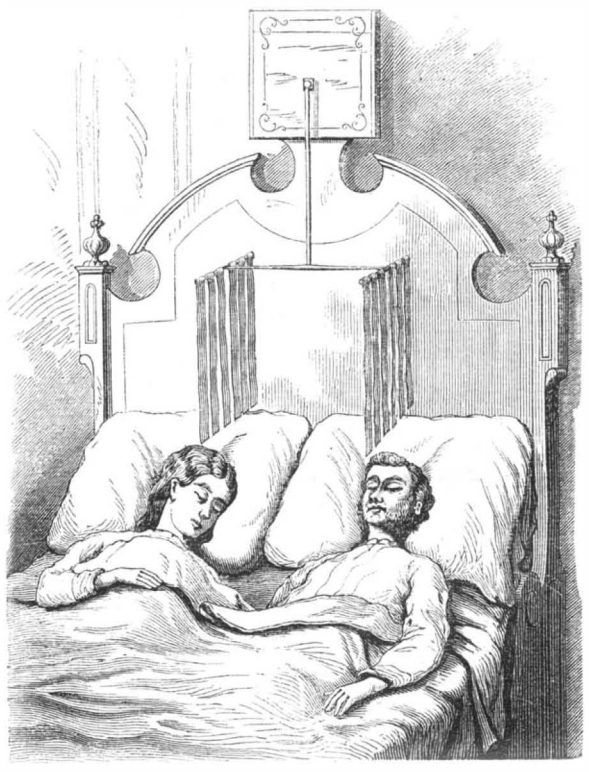
The success of this excellent and economical mode of publishing the patent drawings, will, it is to be hoped, induce Congress to provide the means for the printing of the specifications in the same concise manner. If fine types are used, and care taken not to waste space in the margins, it will be practicable for the Government to issue printed copies of all the patents, occupying only eight or ten volumes a year, at a cost to subscribers of from ten to twenty dollars. This will be a work of great public importance and value. At present the drawings are given in full but not the specifications. Only the concluding portions, or claims, of the specifications are now published.

AUTOMATIC FAN.

The invention we now illustrate is peculiarly applicable to the present season, as it is intended to provide simple and efficacious means for cooling the air in, and driving away insects from, the vicinity of the person. It consists in an arrangement of clockwork, by which fans of various forms can be conveniently operated in such positions as may be required.

The clockwork used is contained in a suitable frame, and is actuated by either a spring or weight, as found most convenient. The last shaft of the train carries a wheel which has a star-shaped slot or groove cut through or formed in its face. A lever is pivoted at one end to the frame, and carries at the other a little pin and roller which enter the star-shaped slot or groove in the wheel. By this construction an oscillating motion is imparted to the lever by the revolution of the wheel; and, in consequence of the momentary check, given as the roller passes either of the angles in the star, the mechanism also serves as an escapement. The stem of the fan is connected in any suitable manner with the oscillating lever or its pivot, and the proper waving motion is thus communicated to it.

Our engraving represents the apparatus attached to the



head of a bedstead and employed to swing a double fan for the two-fold purpose of cooling the air and keeping off flies and mosquitoes. The inventor states that the machine, when actuated by a weight, will run for six hours and a half where the room is ten feet high. He considers the employment of such a fan in the sick room most advantageous.

Patented through the Scientific American Patent Agency, February 27, 1872, for Mr. J. B. Williamson, of Louisville, Ky., of whom further information may be obtained by addressing him through P. O. drawer No. 79, in that city.

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THE BRITISH MONITOR "GLATTON."

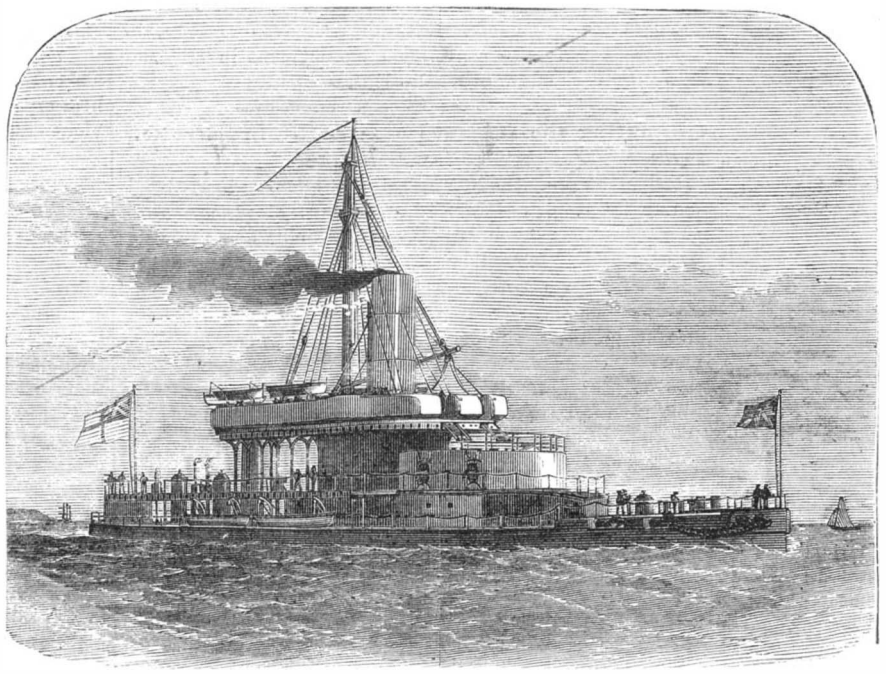
Last week we gave an account of the cannonade of this new ship by the heavy guns of the *Hotspur*, at a range of 200 yards. We now present an engraving of the *Glatton*, together with sundry other illustrations, showing the effects of the projectiles upon the fourteen and fifteen inch plates composing the *Glatton's* turret.

The *Glatton* carries a single revolving turret in which are mounted two of the heaviest guns in the service. The vessel is 2,700 tuns measurement, 54 feet wide, 264 feet long, and draws 19 feet. The following particulars of the trial are derived from the *Engineer*:

The turret of the *Glatton* is roughly shown in horizontal section through the upper plates in Fig. 1. Her armor consists of plates laid on in two rings or tiers, each consisting of eight plates, the upper ring or belt having six plates of 12 inches thick and two plates of 14 inches thick, namely, those pierced by the portholes. The lower ring contains seven plates 12 inches, and one plate 14 inches thick, the last mentioned being that between and beneath the portholes. The backing, not being liable to cause injury from coming in contact with iron in the proximity of salt water, consists of oak, not teak. It is of such thickness as, with the plates, to make up a total of 29 inches everywhere—that is, 15 inches of oak behind 14 inches of iron, or 17 inches of oak behind 12 inches of iron.

Behind the backing comes 1½ inch of skin, consisting of two thicknesses of ¾ inch plate; then vertical girders, 5 inches in depth with spaces between, and finally, what may be termed an inner skin or mantlet skin of ¼ inch iron, to prevent bolt heads and splinters from flying into the interior of the turret and injuring the men working the guns on service.

Against the strongest portion of this structure, the 12 inch gun of 25 tuns weight of the *Hotspur* was brought to bear at a range of 200 yards, firing "Palliser large cored shot," or, speaking loosely, "Palliser shell without bursting charges."



THE BRITISH MONITOR "GLATTON."

As regards the object of the experiment, it was clear that the turret would be subjected to such a test as it would hardly meet with on service; for should the *Glatton* be

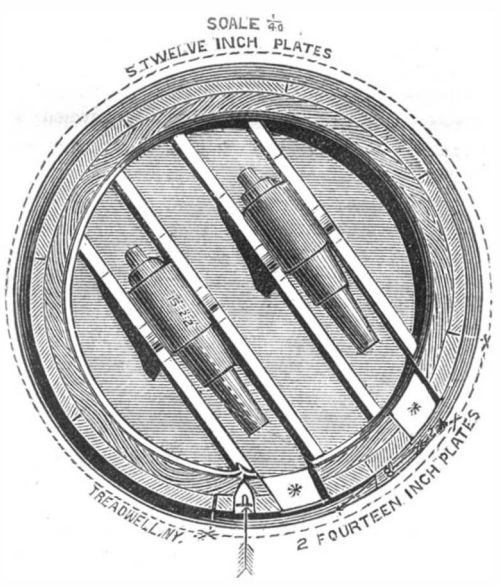


FIG. 1.—HORIZONTAL SECTION THROUGH TURRET AT LEVEL OF PORTION STRUCK BY SHOT I.

even exposed to the fire of guns equal to that of the *Hotspur* at 200 yards range, it would be very unlikely that she would receive so fair a blow as on this occasion; while, should she be closer than 200 yards, although the shot would strike harder, it would be rather less likely to be quite true in its direction, from not having time to steady after leaving the muzzle.

The first shot struck at the spot marked I in Fig. 2, with effects shown in Figs. 1 and 3. The shot stood well up to its work, the front portion, as far as the front ring of studs, remaining apparently intact and buried deep in the turret side.

We have presumed to show in Fig. 3 the place occupied by the shot's head and the depth to which the point has penetrated; we believe this cannot be far wrong on the following grounds: The rear edge of the front studs was about 6½ inches past the face of the plate, and the projectile, if a Palliser 12 inch shell, would measure from this to the point nearly 14 inches.

Supposing our estimate to be correct, the following are the effects produced, shown by the numbering and arrows in Fig. 3:—(1.) The entire upper plate forced back to a distance at point of junction with lower plate of 5½ inches; (2) shot penetrated to a depth of nearly 20½ inches; (3) horizontal joint between upper and lower plate opened to a width of 2 inches, the same effect being manifest in the corner of the top plate being lifted 2 inches higher than that of the adjacent plate; (4) the lower plate cracked in a vertical and laminating direction, if such a word may be allowed, and otherwise contorted at the edge; (5) a bolt driven some inches backwards, the head flying into the interior of the turret; (6) the double skin being bent back and forced open to a width of about 3 inches, the wood protruding; (7) the ¼ inch or inner skin torn open and hanging down to the extent of about 4 feet by 18 inches, standing well up to its work and coming easily out of the hole, uninjured as far as the front row of studs.

The effects produced by this round are chiefly shown in Figs. 4 and 5. They are—(1) Penetration about 15½ inches; (2) glacis plate grooved to a depth of about ½ inch, and cracked; (3) flange ring covering joint of turret and glacis, cut through and bent; (4) lower side of glacis plate bent back, and split open to a width of about ¾ inch; (5) (not shown in figure) a sort of binding plate, fixed on the lower edge of the armor

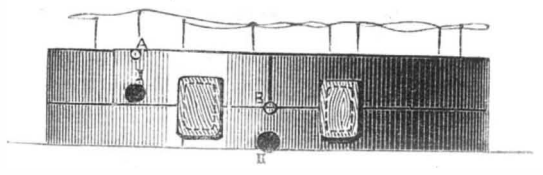


FIG. 2.—FRONT ELEVATION OF TURRET FROM FIRING POINT AFTER STRIKING AT I. AND II.

side beneath the deck, broken off for a length of some feet, and the edge bulged downwards.

This round again severely tested the working of the turret, not perhaps quite so severely as might be conceived were a similar blow to fall in a more downward direction, but quite

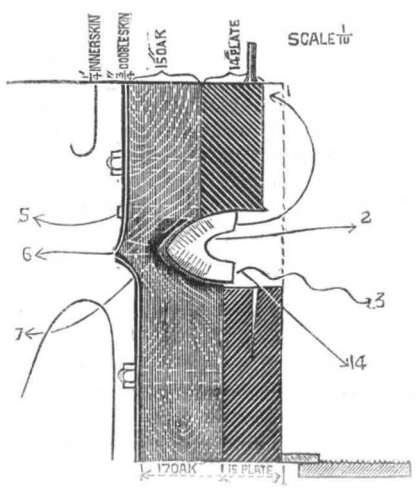


FIG. 3.—VERTICAL SECTION THROUGH PORTION STRUCK BY SHOT I.

the kind of blow intended. On trial the turret was again found to work freely and easily. The ports, which up to this time had been covered and plugged up with beams of wood, were cleared open, and two rounds were fired from each gun; one a full blank charge of 70 pounds of pebble powder, and one a battering charge of 85 pounds of pebble powder with shot. The turret revolved easily in about a

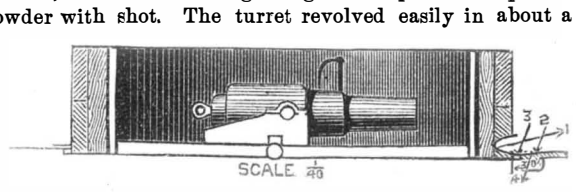


FIG. 4.—VERTICAL SECTION OF TURRET THROUGH PORTION STRUCK BY SHOT II.

minute, and we are not aware that any effort was used to obtain speed. In short, the *Glatton* was in good fighting trim at the conclusion of the experiment. Considering how great are the chances against a second shot falling exactly on a spot already struck, it would hardly be going too far to say that the *Glatton* was in nearly as good condition to go into ctaion as before the trial. Yet, it would be difficult to put her through a more severe ordeal except by bringing the 35 tun gun to bear on her, and as for the object of the experiment, namely, injury to the working of the turret, it may be doubted whether much more effect would, even then, have been produced. A plunging fire we are inclined to believe the most likely to jam the turret.

Engineering says:—The result of the contest between the 25 tun gun of the *Hotspur* and the turret of the *Glatton* is almost an exact counterpart of that obtained by the trials which took place on Friday the 15th of June, 1866, when the armor of the *Royal Sovereign* was attacked by the 9 inch 12½ tun gun of the *Bellerophon*, and this trial again finds its counterpart in September, 1861, when Captain Powell conducted a lengthened experiment against the cupola gun shield of Captain Coles, on board the *Trusty*. In each case, the heaviest available artillery was brought to bear against the shield; in 1861 the 100 pounder Armstrong attacked the light cupola defence; in 1866 the 12½ inch gun was resisted by the 8½ inch plates and 14 inches of teak backing, which formed the protection of the turret of the *Royal Sovereign*, and in the recent trial (July 5th, 1872) the 25 tun gun, throwing the 600 pound shot was repulsed by the 15 inches of armor backed by 14 inches of teak, which was opposed to it on board the *Glatton*.

Satisfactory as these results are in one respect, pointing as they do to the continual precedence which the science of defence takes over that of attack, it must nevertheless be borne in mind that such a partial and peaceful experiment as that of Friday last cannot be compared to the rough realities of war. So far as it went, however, the trial was all in favor of the turret, and while we may congratulate ourselves upon the power of resistance it exhibited, we cannot regard with satisfaction the performance of the gun. True, the Palliser shot stood well to their work, the first one penetrating through 14 inches of armor plate and 4½ inches of wooden backing, and making a gap of 2

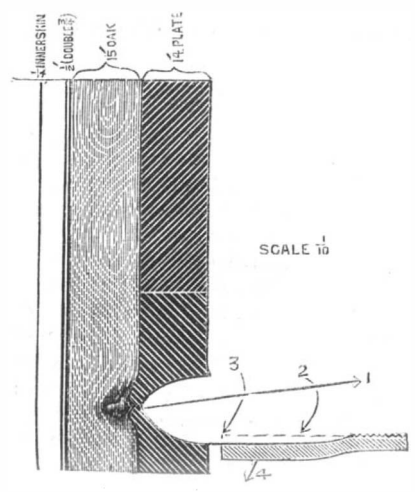


FIG. 5.—VERTICAL SECTION THROUGH PORTION STRUCK BY SHOT II.

inches between the upper and lower 15 inch outside plates; while the second shot, glancing on the glacis plate, penetrated 13½ inches into the armor. But the most unsatisfactory part of the trial lay in the difficulty experienced in getting the shots to go where they were wanted.

TWELVE LOCOMOTIVES DESTROYED.—On the 24th of July, the repair shops of the Erie Railway at Jersey City, N. J., were destroyed by fire, the loss of property amounting to nearly one million dollars. Five hundred men were thrown out of employment. Twelve locomotives were lost, together with many cars and much valuable machinery. Among the locomotives was a new one lately built by the Rogers Locomotive Works, at a cost of $40,000.

DURING a recent Sunday school convention held in Ballston, N. Y., one of the delegates hitched his horse in the street and allowed it to stand there in the hot sun from 8 o'clock in the morning until after 5 in the afternoon (nine long hours) without food or drink. It was a black, small pony with one white hind foot, hitched to a black gold mounted top buggy, in which was a white blanket trimmed with red. During the afternoon some one placed a card on the horse on which was printed: "I belong to a Christian; I have stood here since morning without food or drink."

THE caisson, on the New York shore, for the Brooklyn suspension bridge, is now filled in, and the erection of the stone tower will proceed as rapidly as possible. The tower on the Brooklyn side has reached the hight of 105 feet above high water. The towers are to be 150 feet high. The wire cables will be 120 feet above the water. The span of the bridge is 1,600 feet.

THE Croton lake from which New York is supplied with water is nearly forty miles distant from the city.

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Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

The Young Machinist Once More.

To the Editor of the Scientific American:

I noticed an article signed "A Young Machinist" on page 20, volume XXVII, saying that he was glad he learned a trade; but it would seem from his talk that he was sorry he did not learn the right one. It seems he is one of those who think no man should be allowed to run a locomotive unless he was a machinist. Now I think there are greater qualifications than that. No man, not even a machinist, can face off valves or build boilers on the road, and make his time. An engine must go into the shop for repairs, even if the engineer be a machinist. From his communication, it would seem that he believes that the companies take men right off the street, who know nothing about grades, running just fast enough and not too fast, nothing about fire, water, or making time and keeping out of the way of other trains. I am not a railroad man now, but some time ago I was fireman for nearly two years. We were on a branch road away from the shop. The man I fired for served six years as fireman, which was the average time on that road; and he did not have his engine in the shop but once and that was for a broken tire. What machinist could have done better? But there was more than this. Twice it seemed as though we were rushing to instant death, and, although his face was white, he showed no sign of fear but stood to his post like a man and brought his train out in safety. After we left that road, there was an engineer put on who was a machinist, a good man to repair engines, etc. One day, he was passing out of a station with a passenger train, running perhaps six or eight miles an hour around the first curve, when he met a freight train coming in; and without calling for brakes, without reversing his engine, without even shutting off steam, he took the leap and left his train to its fate, although had he stood at his post no accident could have happened, as the freight train was stopped when they came together. The engines were damaged and some of the passengers injured, although none fatally. Which of the men was the best engineer? Which the safest for the public or Congress to trust their lives with?

I clip the following from the *Brotherhood of Locomotive Engineers' Monthly Journal*:

"Now take two young men, each 21 years of age. One has served his time at turning tires, boring out cylinders, facing valves, and other work necessary for the building and repair of engines. The other has fired the usual time under the eye of some careful engineer, and has become familiar with the locomotive and railroading in all its various forms, has been on the engine in rain, snow, dew, fogs, in warm and cold weather, by day and by night, up hill and down, through the forest and over the open plain. He has seen the engineer overcome all the difficulties that are apt to occur; he has assisted him to take down and put up every part of his engine; he has been with the locomotive in all its vicissitudes; he has, by constant use and observation, learned how tires should be turned, valves faced, etc., and now he is declared master of his trade. And now they stand side by side, each one ready to compete for the championship of the iron monster. Now take the difference in the two men. The former one has not been accustomed to move his iron steed; he knows nothing of railroading and its ups and downs. In the latter, the locomotive has been his protégé, and he has traveled miles enough by it to carry him many times around the globe. And now I ask all manner of men: Which train are you going to take? Husbands and fathers, in whose care will you trust your wives and little ones to be whirled away into the midnight darkness?"

I do not wish it to be inferred that I think a machinist cannot be an engineer, for such knowledge would be a help to him; but I think they are two different trades, and I do not like to see a man of one trade call a man of another an "ignorant wretch" because he gets more pay than himself, or because he does not understand another trade than his own in all its details. ALECK.

Waterbury, Conn.

A Question in Architecture.

To the Editor of the Scientific American:

The county Board of Supervisors of this (Dickinson) county is rebuilding the court house of bricks which were in the walls of the original building burned last fall. The walls were then blown down by the wind. The bricks were cleaned off and relaid into a wall the second time, which was also blown down when it had got up to the middle or the second story windows or thereabouts. The bricks were then recleaned; again the wall was relaid with the same bricks, the inner course being filled up with pieces of brick. This wall for the court house and public offices is 30 x 50 feet on the ground, the partition walls being all lath and plaster. The wall is 24 feet high and only 12 inches thick from bottom to top; the former wall which was burned was 20 inches thick below and 16 above.

This building stands on the highest elevation, probably, in the State, with not a tree or shrub for miles to break the force of the terrible winds which sweep over our prairies. Now I contend that these walls are not safe, but, on the contrary, are a perfect mantrap and will probably kill somebody. What is your opinion? T. S. SEYMOUR.

Milford, Iowa.

[This is not surprising in view of the mania at the West for thin walls. No amount of experience in the disastrous results from weak structures seems adequate to insure stronger buildings. The thoroughness of the destruction of Chicago was owing in no small degree to a deficiency of the thickness of the walls. Party walls 8 inches thick were quite common there, and some were only four inches. Very few of the walls stood after the timber was burned so as to fall to the cellar. There was not sufficient substance in the walls to stand alone. They depended upon the timber for support; and as soon as this support was removed, the walls fell, leaving an open field for the flames. Chicago was essentially a *wooden* city, although apparently built with brick.

Buildings, to be durable, should have walls strong enough to stand alone. The walls of the court house above referred to, 50 feet long, unsupported with cross walls at any intermediate point, ought to be two feet thick in the principal story and twenty inches thence to the roof; and they should be built with new, hard, whole bricks well bedded in a sufficiency of best mortar. Built in this way, their stability would be unquestionable. But built as above described, the builders would have continuous employment in restoring them after each storm of wind.—EDS.

Estimating the Distance of a Lightning Stroke.

To the Editor of the Scientific American:

During the great thunder and lightning storm in Philadelphia, in the evening of July 4 last, frequent discussions arose in regard to the probable distance of thunder and the velocity of sound in air. Some maintained that sound travels over a mile per second, and others said that the velocity of light must be considered in estimating the distance of the thunder, all their opinions varying greatly from established facts in physics, for which reason I propose to send you a table on that subject, which you may consider worthy of publication in the SCIENTIFIC AMERICAN.

DISTANCES IN FEET WHICH SOUND TRAVELS IN AIR.

Time of travel.	Temperature of the air, Fahr. 50°.	60°.	70°.	80°.	90°.
Seconds	Feet.	Feet.	Feet.	Feet.	Feet.
1	1,109·6	1,120·6	1,131·1	1,142·5	1 153·2
2	2,219·2	2,241·2	2,262·2	2,885·0	2,306·4
3	3,328·8	3,361·8	3,393·3	3,427·5	3,459·6
4	4,438·4	4,482·4	4,524·4	4,570·0	4,612·8
5	5,548·0	5,603·0	5,655·5	5,712·5	5,766·0
6	6,657·6	6,723·6	6,786·6	6,855·0	6,919·2
7	7,767·2	7,844·2	7,917·7	7,997·5	8,072·4
8	8,876·8	8,964·8	9,048·8	9,140·0	9,225·6
9	9,986·4	1,008·5	1,018·0	1,028·2	1,037·9
10	1,109·6	1,120·6	1,131·1	1,142·5	1,153·2

The velocity of lightning is probably not less than the conduction of electricity through the best conductors, or about 200,000 miles per second, and the time occupied for only a few miles is so small that it could not be appreciated or recorded without extraordinary instruments for that purpose, for which reason it is disregarded in approximating the distance of thunder.

The occurrence of a lightning flash cannot be anticipated, and we are therefore generally unprepared to record the exact moment, which frequently comes unexpectedly, when no appropriate time keeper is at hand. In a room where the beats of a clock's pendulum can be heard or seen, it is easy to count the beats between the lightning and the thunder, by which the time can be approximated. With some practice, the beats of seconds can be counted with tolerable correctness without the aid of a time keeper, which practice has been of great service to me in astronomical observations. We should practice counting seconds with the second hand of a watch until the countings agree, without looking at the time keeper for a minute or two. The counting should not differ more than one second in a minute, by which means the time between the lightning and the hearing of the thunder can be closely approximated.

In observing the altitude of the sun or lunar distances, at sea, it is customary to keep a watch ready in the hand, or to station an assistant at the chronometer to note the time when the observer says "Stop;" but there are known cases when the captain has taken observations without a watch or assistant, and walked slowly and comfortably to his cabin and noted the time of his observation from the chronometer, with no little amusement to the mates and others, who naturally supposed that the captain's observation could not be very correct; but to their surprise it was found to be as correct as their observations with ordinary precautions. The fact was that the captain counted in his mind the beats of seconds, and deducted the sum from the time observed on the chronometer.

I have made a great many astronomical observations of different kinds in the interior of South America, particularly of eclipses of Jupiter's satellites; but when I have no instrument connected with the telescope for the purpose of recording time, I have never attempted to note the time of observation directly, but counted the beats of seconds and turned myself comfortably to the chronometer and deducted the counting, which generally amounted to four or five seconds. The practice of counting seconds correctly is very useful in a great variety of cases. In actions of very short duration, say less than three seconds, it is best to count half seconds, or even four times in a second, and the time may be determined with a correctness to less than a quarter of a second.

JOHN W. NYSTROM.

Capacity of the Boston Coliseum.

To the Editor of the Scientific American:

The Coliseum was estimated by the Boston newspapers as capable of seating an audience of from eighty to a hundred and twenty thousand, besides a chorus and orchestra of twenty to thirty thousand; so that averages of "half houses" were expected to be sufficient to yield immense profits. The houses, however, averaged three quarters full and yet money was lost.

Now for the explanation by feet and inches. According to the lithographed plans of the building, the entire seating capacity of the auditorium was less than 17,000 persons, and that of the orchestra and chorus less than 12 000. Deducting the obstructions of posts and stairways a maximum of 28.000 persons might have been seated at one time, of whom 16,500 might be classed as audience. At no time was the number of persons standing at the concerts greater than the number of empty seats, and certainly the "deadheads" numbered 2,500, so that it were unfair to estimate for more than 14,000 paid tickets for a full house, or for an average exceeding 9,500 paid tickets to all the concerts. This, if substantially correct, accounts for the failure financially.

The space under the galleries was almost entirely occupied as reception rooms, offices and passage ways, so that we have only to deduct, from the total of some 200,000 square feet of surface, the rather small estimate of 50,000 square feet of stairways and passages, not under the galleries, and divide the remainder by the five feet which a person sitting requires. This gives a maximum capacity of 30,000 persons, and is quite near enough to prove the substantial correctness of the previous figures. B.

Demoralization by Leisure.

To the Editor of the Scientific American:

The article in your issue of July 21st, credited to the *Christian Union*, seems to me to demand some notice, as, I think, it contains more absurdities than I have ever before seen in the same space. The world would be much better off if every human being, who has the strength, would work from one to ten hours per day, as circumstances required, at some useful and productive employment. Mental strength can only be maintained by a proper amount of physical exercise, and it is far better that this should be useful than useless. When all do their part, an average of five or six hours' labor per day will supply all our wants, relieve the overworked, strengthen those who need it, banish sickness, and leave plenty of time for mental improvement and recreation. The "leisured class," with exceptions as rare as angels' visits, are worse than useless. For proof I point you to the aristocracy-cursed nations of the old world. The more society has of this class, the worse it is off, for the mere laborer sinks into a condition of stolid ignorance and brutality, while the "leisured class" plunges into a gilded debauchery, destructive of every good principle.

Society owes everything to labor, mental and physical; nothing to the "leisured class."

A pampered bigot may charge upon our Heavenly Father the inequalities caused by man's injustice, but such blasphemy can never emanate from the brain of any true Christian.

I could fill volumes with the sins and shortcomings of this so called "leisured class," but will only mention one or two. They make a mock of marriage; they tempt thousands, who would otherwise be ornaments to society, to a life of shame; and, after the poor victim has spent the best portion of life in pandering to their base passions, and a fresh one is wanted, she is turned into the street to sow the seeds of moral and physical pollution among the laboring classes. But enough of this. I am very glad to find a grain of sense and truth, at last, where he says: "The safety and progress of humanity, as a whole, depends on each man's serving faithfully;" but if he expects it to be done without murmuring, he expects too much. Where but little is given, but little is required, and the reverse.

I am a working man, but I believe all strikes, however they may terminate, injurious to the working classes, and I may give my reasons some day, when I have leisure, through the SCIENTIFIC. J. E. S.

Portland, Me.

The Underground Railway in Baltimore.

To the Editor of the Scientific American:

With all the advantages of education, engineers of public works appear to be at fault at times. The Potomac tunnel, now being constructed under one of our streets, passes through a variety of soils and, in some places, through solid rock. At first no counter arches were built on the soft clay soil; hence the great weight of superstructure and filling on top to line of strut was too great for the soft clay foundation, causing the whole superstructure to sink, throwing the clay up in the roadway. Of course there was nothing left but for the engineers to have counter arches built on all such soil.

A common observer would have supposed that, had they ever engineered a similar work, they would not have risked this one without the counter arches.

Baltimore, Md. J. W. L.

How to Destroy Wigglers.

To the Editor of the Scientific American:

I have a number of water barrels around my outbuildings, besides a cistern. The water in the barrels suits best to water plants, being warmer than cistern water.

But the wigglers breed in it by thousands. I have been trying to destroy them, and have found out what will kill every one in an hour. Pour a few drops of burning oil upon the water, sufficient to cover the surface; stir a little to be sure of completely doing this, and draw off the water below. Add oil if anything disturbs the covering. It has answered well with me.

Cleveland, O. W. WARD.

AT the recent exhibition of the Royal Agricultural Society Cardiff, Wales, an eight horse portable engine, made by Clayton & Shuttleworth, worked for five hours under a consumption of 2·92 lbs. of coal per horse power per hour—an unparalleled result for a non-condensing engine.

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Small Fast Steam Propellers Again.

To the Editor of the Scientific American:

A plain working man, laboring 60 hours in the week, with but one day in that time to call bis own, I had not expected, in publishing an article in your valuable paper on this sub ject, to provoke a correspondence from nearly every State in the Union, making enquiries how such a vessel can be procured, how she should be constructed, her cost, etc. At the risk of repetition, I will ask your kind assent to reply to these correspondents through your valuable paper. The boat described before is 50 feet long, 45 of which is hull and 5 feet of it overhang at the stern, beneath which the propeller is placed. She has a forecastle deck of about the same size (5 feet), is 7 feet beam, and 54 inches depth of hold. She is built of oak by a common house carpenter who had worked on canal boats in the State of New York. The stern and stern posts are very heavy and strong, as are the floor and side timbers, all well ironed, and as staunch as could be made. The hull is flat bottomed and a foot narrower at the bottom. A deck 40 feet long, 8 feet high from the bottom floor, protects the machinery and passengers from the weather. The vessel is propelled by a screw wheel having four fan-shaped blades 2 feet long, and 2 feet wide in the widest part, bolted to a wrought iron hub with flanges set at an angle of 45° with the shaft. The machinery has already been described. The whole cost of this boat has been about $1,500; and for general jobbing, towing, and pushing rafts, or work where speed is needed, she is better worth the money than many boats which cost four or six times as much.

We are indebted to your valuable paper for much information which has aided us in making this boat a success. Without any previous experience in building such craft, we found by reading the English article you published that the wheel was too large for the power. By cutting out one third of the filling, making the blades 2 feet wide instead of 3 feet, we took one third the labor off the machinery, and gave fully that much or more speed to the vessel.

In the former article, I said she would carry 20 or 30 passengers. On July 4th, the engineer had a benefit by going short excursions, and as her speed had attracted public attention she was crowded all day. She carried 46 passengers with perfect safety, and only seemed to run faster for being so heavily loaded. That day she repeatedly made a mile in 4 minutes, and in calm weather she regularly crosses the river, five eighths of a mile, in 2 minutes and 40 seconds. Her economy of fuel is remarkable, burning only 10 bushels of rather poor soft coal a day; and her entire crew consists of one man, who manages her with perfect ease and safety, the steering wheel being close to the engine, and everything very convenient.

As quite a number of your readers appear to want a boat of this sort, there are doubtless competent draftsmen in New York who would furnish complete drawings to build by. The circular slide valves are used on the engines of this boat with great success. J. A. G.

Force of Falling Bodies.

To the Editor of the Scientific American:

Since you are publishing a series of articles on "Weight, Pressure, Power, Force," etc., it would be useful to so explain the acting force of a body in motion, its momentum or striking force, that, if such a thing be possible, your readers may understand what it means, by what it is measured, and how determined.

While this is one of the simplest problems in physics, as well as one of the most essentially practical, it is one of those of which the majority of the people are most profoundly ignorant, as is shown by the frequent questions on the subject in your valuable paper, and by the replies, no two of which are alike, and which indicate that the correspondents are hopelessly befogged.

In your number of July 6, page 10, a correspondent—misled by Haswell probably—estimates the force of the hammer, weighing three tuns and falling four feet, at over 160,000 lbs. But what does he mean? What is a pound of force? To what is it equal? What work will it do? He does not say foot pounds, and if he means that, he is wide of the mark in his estimate. A blow cannot be compared with weight or pressure alone.

It should be universally known, if possible, that force is estimated by the measure of the work it is competent to perform, the number of pounds it will raise one foot high. The force which will lift one pound one foot is called a foot pound, and is the unit used to express the amount of a force. Gravitation, being a constant quantity, is a convenient standard, and force measured by the amount of gravitation it will overcome affords a statement quite intelligible to any intelligent person. Next, it should be known that this same one pound, in falling freely one foot, will accumulate the same amount of force, that is, gravity will impart to it in its descent the same amount of force which it took from it in its ascent, and therefore the force of the blow will be just one foot pound; and, if converted into heat, would produce exactly the amount of heat which would be required to lift the one pound one foot high again.

In general, the force with which any falling body will strike is precisely the amount required to lift the same body to the hight from which it fell. When, therefore, the weight and hight are given, their product is the force of the blow in foot pounds, and, in the case of this hammer, would be $6{,}000 \times 4 = 24{,}000$ foot pounds. The force of a "weight of one pound falling two feet" would be $1 \times 2 = 2$ foot pounds, while Haswell's "Engineers' and Mechanics' Pocket Book," page 419, gives it at 11·34 lbs., whatever that may mean.

If the velocity is given, we find the hight as follows: Dividing the velocity by $32\frac{1}{6}$ (the velocity acquired in each second) gives the time of fall in seconds, and multiplying the square of the time by $16\frac{1}{12}$, we have the hight from which the body must have fallen to acquire the given velocity, which, of course, is also the hight to which the body would ascend, if projected upward with the same initial velocity before its force would be expended in overcoming gravitation. Obviously, the force of the blow will be the same, with the same velocity, whether the motion be downward, upward, or horizontal; hence, to find the force with which it is moving, we only require to find the hight from which a body must fall to acquire the given velocity, and said hight, multiplied by the weight, gives the striking force in foot pounds, or the amount of work the body would perform, the resistance it would overcome, the weight it would lift one foot, or the heat it would produce; and also, what is the same thing, we have the amount of force expended in imparting to the body the given velocity.

The general confusion of ideas upon this subject is probably largely due to the fact that the text books differ widely, and the majority of them are entirely wrong, as they almost all teach that the striking force is proportional to the velocity, whereas it is, in fact, proportional to the square of the velocity, as is readily shown by the law of falling bodies enunciated in the very same books.

The formula above given is far more simple than the various arbitrary and fantastic ones so often presented by your correspondents, and has the peculiarity of being correct, and consequently consistent with all the laws of motion; and if you will give me space for a few examples, I believe its application will be perfectly plain to your readers. Instead of dividing the velocity by 32·16 and multiplying the square of the quotient by 16·08, we may, of course, obtain the same result by the shorter process of dividing the velocity by 8·02, and squaring the quotient.

1. A one pound ball moves 1,000 feet per second; $(1{,}000 \div 8{\cdot}02)^2 = 15{,}545$. Its force then is 15,545 foot pounds, and as it weighs one pound, if its motion were directly upward it would mount to the hight of 15,545 feet, and on returning would acquire in its descent the same velocity of 1,000 feet. The force expended, then, in imparting this velocity was equivalent to that required to raise 15,545 pounds one foot.

2. A twenty-four pound ball has a velocity of 50 feet per second; $(50 \div 8{\cdot}02)^2 \times 24 = 931{\cdot}44$ foot pounds. If this twenty-four pound weight were a hammer with a stroke of 38·81 feet, it would acquire a velocity of 50 feet, and would strike with a force of $38{\cdot}81 \times 24 = 931{\cdot}44$ foot pounds, and this amount of force, in any available form or mode of manifestation, would be sufficient to impart a velocity of 50 feet to a mass of 24 pounds, or to lift 24 pounds 38·81 feet, or to lift or throw one pound 931·44 feet high, or 931·44 pounds one foot high. In these calculations, there is no allowance made for atmospheric resistance. W. H. PRATT.

Davenport, Iowa.

Novel Experiment by Tyndall.---Ignition of Diamonds by the Electric Lamp.

In a recent lecture before the Royal Institution, Professor Tyndall said:—

Most of you know that wonderful prediction made by Newton respecting the diamond; his powerful mind, antedating the discoveries of modern chemistry, pronounced it to be an unctuous or combustible substance. We now know that the diamond, beautifully transparent, highly refractive as it is, is identical in its composition with charcoal, graphite, or plumbago.

A diamond is pure carbon, and when burnt as I am about to burn it, yields the same products as carbon would if burnt in the same way. I have a diamond held fast in a loop of platinum wire; I heat it to redness in this hydrogen flame, and then plunge it into this glass globe containing oxygen. The glow, which before was barely perceptible, extends and becomes brighter as you see. The diamond would go on burning in that quiet way until totally consumed, if the supply of oxygen were kept up. In ordinary air, the diamond will not burn; the oxygen is too much diluted by the nitrogen; its atoms are too few in number to carry on an effective attack, but when concentrated, each of the atomic projectiles is assisted by its neighbor, and as it strikes the surface of the diamond, its motion of translation is arrested and converted into the motion which we term heat, and the heat thus produced is so intense that the crystalline carbon is kept at nearly a white heat, so that the atoms of carbon and those of oxygen unite, and carbonic acid gas is produced.

Faraday describes the combustion of the diamond in oxygen, the necessary initial temperature having been derived from the rays of the sun. The experiment is described in the admirable life and letters of Faraday, by Dr. Bence Jones.

This experiment, he describes as being quite new to him, and as never having been seen before. I hope to show you an experiment of a similar character which has never been seen before—the ignition of the diamond by the concentrated rays of heat from our domestic sun, the electric lamp. In order to prevent chilling from currents of air, I have taken the precaution of surrounding the back of the diamond with a hood of platinum wire.

I now insert the diamond in the focus of the electric beam, and in a few moments the diamond becomes very hot. I think that will do. I now plunge it in the oxygen. There it glows, and so it would continue to glow, and would burn away just like coke, also leaving the same residue behind. In both cases the particles of oxygen impinge upon the carbon, grasp its molecules, and convert them into carbonic acid.

I made reference to the luminosity of flame proceeding from the presence of incandescent solid particles of carbon. An experiment has been devised by Mr. Cottrell which illustrates this, and as it is his experiment I will allow him to perform it.

He will fill this globe with oxygen from the iron bottle by displacement in the usual way. That being done, he now ignites a piece of boxwood charcoal, attached to the cap of the globe by a stout wire, and immerses it in the gas; it of course burns with those beautiful scintillations you have so often seen in this room. But instead of allowing this beautiful combustion to proceed as it is now doing, he directs upon the charcoal a jet from the bottle of compressed gas, the consequence being that the combustion is marvellously enhanced, and, from the currents created by the rush of the gas, the particles of ignited carbon revolve in perpetual orbits, at a little distance producing all the effect of a magnificently brilliant white flame. It is my firm conviction that the constituents of ordinary flame to which we owe its light are mainly these solid particles of carbon; though I must also state that a very distinguished friend of mine holds a different opinion.

My intelligent assistant, Mr. Cottrell, some little time ago arranged two circular gas jets of small bore, so that they should impinge directly the one upon the other; the two flames became blended into a horseshoe form, the extremities of which were spirals, and these spirals perpetually threw off particles of solid carbon. I take this as being another proof of the correctness of Sir Humphrey Davy's old notion that the luminosity of flame was due to the incandescence of some part of the matter which was burning.

Mosquito Manure--A Summer Yarn.

Nature has her compensations. At Stratford, Conn., where the mosquitoes are as thick as a fog, lives an ingenious Yankee, so they say, believe it who may, who puts these insects to profitable uses. He has invented a large revolving scoop net, covered with lace, which is put in motion by a windmill, water power, or steam. The lower half of the scoop is placed in water. The upper half moves through the atmosphere and at each rotation draws immense numbers of the 'squitoes down into the water, where they drown and sink to the bottom. Every revolution of the net draws in an ounce of mosquitoes, or a tun for thirty-two thousand turns of the machine. The mosquitoes thus collected make a splendid manure for the land, worth forty-five dollars a tun.

We know that other insects—the cochineal for example—constitute most valuable articles of merchandize; and it may be that this Stratford mosquito manure will yet become a standard article of commerce. The possibility of making mosquito sirups, glues, dyes, and other goods, from the insect mass, remains the subject for experiment.

Patent Infringement Case.

United States Circuit Court—District of Massachusetts, in Equity.

Alzirus Brown *versus* J. R. Whittemore and others.

This was a case of alleged infringement of the complainant's patent, applied for June 1, 1858, issued in October of that year, and reissued June 16, 1868. The case was argued on the specification of the reissue, which, taken with the drawing and model, shows an improved horse rake for raking hay and grain, in which the wire teeth are coiled round a rake head which is hinged to the rear ends of the shafts, just above and parallel with the axle; this rake head is connected with two levers and treadles which enable the operator to raise the rake with his right foot and to hold it down with his left; a handle is attached to one of these levers to work the same effect by hand. The second claim is for the combination and relative arrangement of the hinged rake head with the supporting axle and carrying wheels, whereby the head is supported above the rear upper edge of the axle; and the lower ends of the teeth, when gathering the hay, occupy positions in rear of the tread of the wheels and forward of a vertical plane on a line with the rear edge of the wheels; and the fourth claim is for the arrangement of the rake head and foot treadles, or either of them, in relation to each other and the axle.

In the opinion delivered by Lowell, circuit judge, the court held that a horse rake made and sold by the defendants came within the claims stated, unless they were construed very narrowly. The defendant's position was that in view of earlier inventions the claimant must either submit to such a limited construction or his claims were void; but they failed to show that the patentee himself, or any one else, had made the particular combination so early as to defeat these claims, if construed according to their plain and obvious meaning; and it was held by the court that there was, therefore, no occasion to restrain them to mean only a rake head hinged to the shafts in the precise way shown by the patent. In the plaintiff's rake, the hinges are attached to the outward lower corner of the rake head, and in the defendant's, to the upper inward corner. It was insisted by the defendants that this feature in the plaintiff's patented machine was the only one in which it differed from its predecessors, but it was shown in evidence that the relative position of the several parts, which is new, is attained and is useful whether the hinges are placed on the upper or lower edge of the rake head.

The opinion of the court was that the two claims were valid and were infringed by the defendants.

Decree for the complainant.

Thos. H. Dodge, Esq., for complainant; Chauncy Smith, Esq., for respondents.

A RAILWAY BRIDGE ELEVEN HUNDRED FEET LONG BUILT IN FOUR DAYS.—The Linden bridge over the Susquehanna river near Williamsport, Pa., was recently burned on a Thursday evening; workmen and materials were assembled next day, and on the following Tuesday the cars were running over the new bridge, 1,135 feet in length. The original bridge was of the Howe truss pattern, roofed and lined inside and out. Cost, $110,000.

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IMPROVED SHEET IRON ROOFING.

Our engravings illustrate a good form of sheet iron roofing, which was patented by Mr. W. S. Belt, of Cincinnati, Ohio, Aug. 8, 1871.

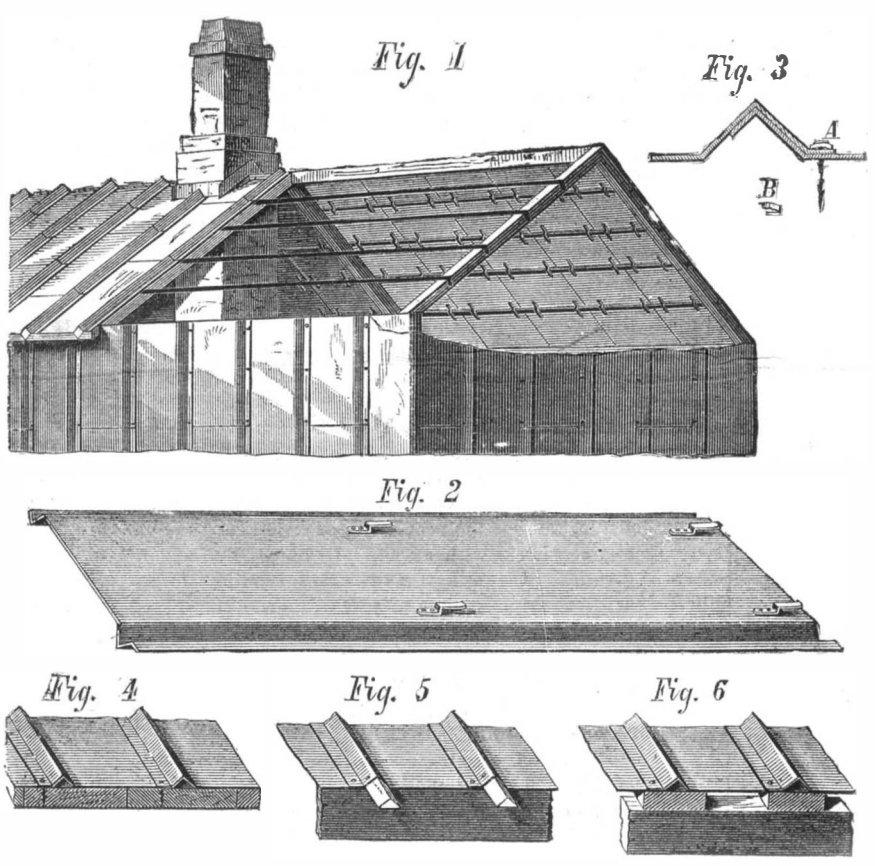
Fig. 1 represents the roofing partly applied to the roof and sides of a building. In Fig. 2 is shown the under side of one of the iron sheets of which it is composed. It will be observed that the sheet is triangularly crimped at its sides in such a way as to allow the crimped portion of one sheet to overlie the crimp of another, (in the manner shown in Fig. 3), and that the lower side is provided with fastenings which are riveted to the plate. The overlying crimp has a perforated flange, through which two adjacent sheets may be nailed to the sheathing or rafters of the roof, as shown at A, Fig. 3. It can readily be seen that, in thus employing the roofing, each sheet is fastened by both of its sides to the supports. The nail used is barbed, and as the fibers of the wood, into which it is driven, soon resume the position from which they are displaced, a very firm hold is taken by it. A lead washer, as at B, is placed between the nail and the plate, and by its use any unevenness of surface is accommodated and an air and water-tight joint formed on driving the head of the nail home into the lead. The sheets are eight feet long and two feet wide between centers of crimps, and, as manufactured, are coated on both sides with paint.

Fig. 4 represents the application of the sheets to a sheathed roof, in which case rough boards of an even thickness are all that is necessary for the sheathing. Fig. 5 shows the mode of applying the roofing to purlins where no sheathing is employed. In this case the purlins may be placed any distance less than eight feet apart, and triangular strips of wood are nailed to, and at right angles with, them, two feet apart between centers, so as to fit under the crimps and support the sheets. Or boards three inches wide may be nailed to the purlins, and the sheets applied to them in a similar manner to that shown in Fig. 6, which represents the mode of attaching the roofing when rafters without sheathing are to be covered. In the latter case, strips of boards are let in, on a level with the upper surface of the rafters, for the ends and centers of the sheets to rest upon. The triangular strip may be placed under the crimp in any case if desired. The ends of the sheets are joined by overlapping them, or by bending them so as to form a lock joint, which, as they are well annealed, can readily be done. The sheets are also easily made to conform to the angles of roofs of either ordinary or peculiar form, so as to make perfectly tight joints and fully preserve the effective character of the roofing. It is applied with such facility, aided by the inventor's directions, as to require no skilled workmen to put it on.

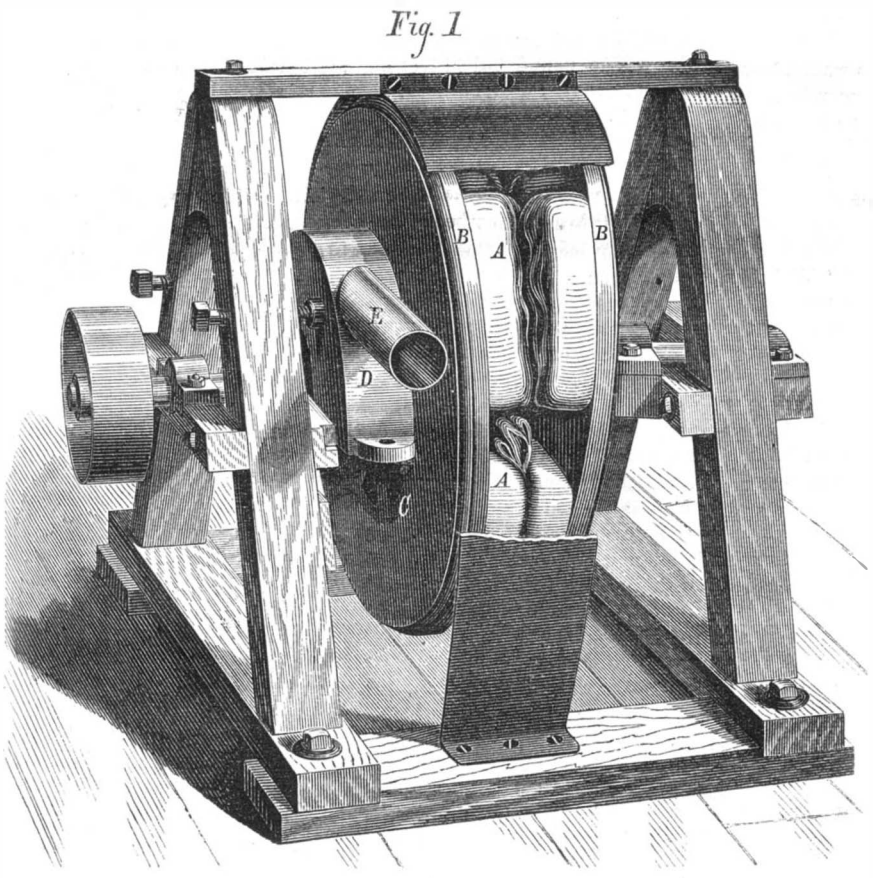
Mr. Belt has also devised a combination iron frame to support his roofing, by the use of which cost is lessened and its fireproof qualities hightened. Its construction will be understood from Fig. 1, where the rafters are seen to sustain bands stretched between them. These bands are made of strap iron and are placed 46½ inches apart. To these bands the fastenings on the under side of the sheets before alluded to, seen in Fig, 2, are hooked, and the roofing thereby secured in position as seen in that portion of Fig. 1 which shows the under side of the roof. By using iron for the rafters, a fireproof roof is made.

Many advantages are claimed by the inventor for this mode of roofing. He says that the crimp gives so much stiffness to the sheet, it is enabled to sustain itself and also considerable weight in the center, when supported only by its ends. There is, consequently, no liability to "bag."

Its fastenings are so secure as to prevent any wind affecting it, and, at the same time, if damaged, it can easily taken out and replaced. The entire roof can be taken off one building and put on another, without damage and at trifling expense, for which reason it is considered admirably adapted for temporary buildings. In all these respects, it is superior to the plain sheet metal roofing, and it is claimed to excel the corrugated; while the same weight of metal in the crimped form covers twenty per cent more surface than if corrugated. In roofing warehouses and small buildings on this plan, from two thirds to three quarters of the wood usually employed could be dispensed with.



BELT'S SHEET IRON ROOFING.



ROTARY PRESSURE BLOWER.

Further information can be obtained by addressing the inventor at 56 and 58 East Third street, Cincinnati, Ohio.

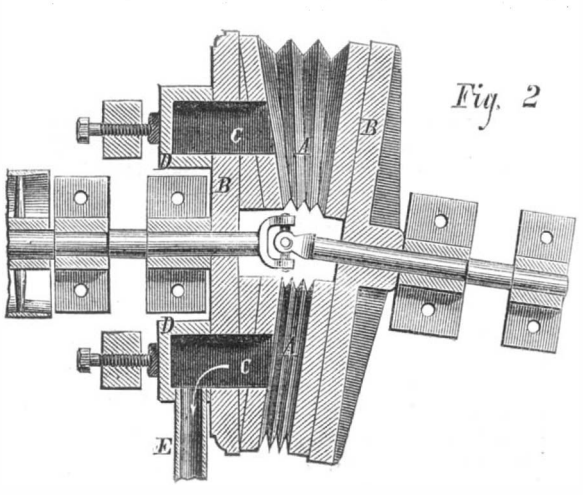
ROTARY PRESSURE BLOWER.

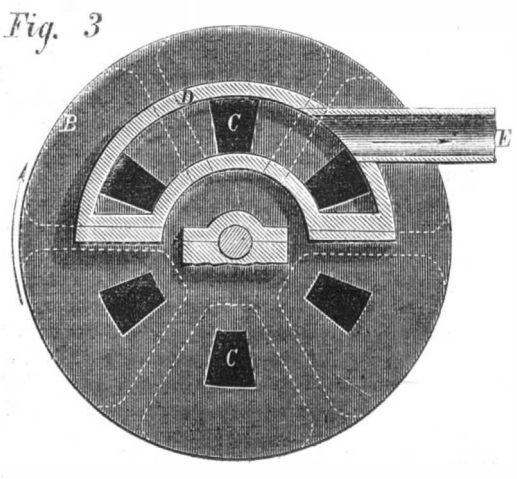
The great expense attending the use of the piston blower, in connection with blast furnaces, forges, etc., and the cumbrous nature of the apparatus itself, have led to the employment in its stead of various forms of fan blowers, notwithstanding that the latter have to be run at a high rate of speed, and consume a great deal of power without producing a proportionately powerful blast. This absence of effect arises from the fan not being positive in its action, the pressure of its blast resulting only from the momentum of the air. The production, therefore, of an effective positive pressure blower, which would compare favorably in convenience and expense with the fan, has long been aimed at by inventive skill, and there is no doubt that such an apparatus would be a valuable addition to the resources of the mechanic in many branches of industry. We this week illustrate a blower which is designed to meet this want, and which we think possesses points of merit.

The machine is represented, in Fig. 1, with a portion of a protective shield broken away to show the parts. It consists of a series of bellows, A, which are placed between and attached to the two disks, B. These disks are mounted on a jointed shaft, as shown in the horizontal section (Fig. 2), the halves of which are set at an obtuse angle in such a manner that the disks are caused to revolve in vertical planes which incline to each other. By the revolution of the disks in this position the opposite sides of the bellows are made alternately to approach and recede from each other, and the bellows are thus brought into action by direct rotary motion. In Fig. 2 are shown the points of greatest expansion and contraction consequent on this motion. The disk next the driving pulley is provided with an aperture, C, for each pair of bellows in the series (shown in detail in Fig. 3), through which the air passes into and from the bellows. D is an air chamber, which is open on the side next the disk, and covers that half of the circle of apertures from which the air is being expelled. The wind is conveyed from the air chamber to the place intended by means of the pipe, E. The apertures connected with those bellows which are expanding are always below the air chamber and open to the atmosphere. A joint, which is sufficiently tight for all practical purposes without causing much friction, is made between the air chamber and the disk by facing them to correspond, and holding the former against the latter by means of the set screws seen in Figs. 1 and 2. In order to prevent danger of bursting the machine, should the eduction pipe get accidentally closed up, india rubber or steel springs are placed between the air chamber and the set screws, so as to allow the air to escape should the pressure within become too great. From the construction described, it will be seen that (in the absence of the springs mentioned) all the air which enters the bellows is discharged through the eduction pipe, and by the positive nature of the action, the amount of pressure developed is only limited by the strength of the material and the power applied. The bellows are made of the best material, and are attached to the disks, which in practice are of cast iron, by means of screws, so that they may be readily removed for renewal.

The economy attached to the use of this blower will, the inventor says, well warrant the renewal of the hide or leather as often as may be necessary. In rare cases, where a large volume of air under heavy pressure is needed, it is better to run two smaller blowers, instead of one large one. They might be run on one shaft, with the driving pulley between them. The blower is, in practice, all cast iron with the exception of the leather and the shaft, which latter is made of wrought iron. The inventor says that it can be constructed for as little as one of the best kind of fan machines, and much more cheaply than blowers made on the rotary pump principle, while it is greatly superior to either. It is intended to be run at a low speed, say from two to three hundred revolutions per minute or less, according to size. The blower may be made to exhaust, either by reversing the motion, or by placing an air vessel, with an induction pipe attached, over the lower apertures.

The advantages which this apparatus is claimed to possess are cheapness of construction, saving in power, and increased pressure, volume, and steadiness of blast. When used with a blast furnace, the tweers are always kept free, which result is not obtained by a fan. It is noiseless in action and is applicable to all purposes to which a blower can be put. It is well adapted for blowing air through, or exhausting it from, pneumatic dispatch tubes, etc. For further information, address Mr. J. Pusey, 228 South 3d street, Philadelphia, Pa., who is the sole proprietor of the patent, and who is desirous of disposing of rights in whole or in part.





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COSMICAL CAUSES OF CHANGES OF CLIMATE.

In a former article, under the head of "Changes of Climate," we have given some of the arguments adduced in favor of the haeory that our planet is still undergoing the cooling process, which geology proves that she was undergoing millions of years ago. Another argument in favor of this theory, not founded on observation, is the *a priori* consideration that our earth possesses, interiorly, a temperature far above that of the surrounding planetary space, and that, therefore, according to the laws of distribution and radiation of caloric, a slow loss of heat must take place, tending ultimately to make the temperature of our whole globe equal to that of the space she moves in; that is, according to Pouillet, 240° below the zero of Fahrenheit.

The solar caloric radiation, enormous as it is, is without influence on the temperature of the earth's interior, it having been proved that the whole effect penetrates the surface to a limited number of feet only, and is as easily lost by radiation during the night and the winter as it is received during the day and the summer season. The incapability, of the apparently powerful solar radiation, to prevent a planet from losing its own heat, is forcibly illustrated by the present condition of those tops of our earth's mountain peaks which are elevated above the snow line, where, even under the tropics, a perpendicular midday sun is unable to raise the temperature above 32° Fah. The present condition of our moon is another case in point; we know now that this satellite has cooled down far below the freezing point; that practically it has no atmosphere, and that all its water, long ago, has been chemically combined with the lavas of its surface into hydrated rock, similar to those of our earth, which contain, in solid condition, a mass of water perhaps equal to half that of our oceans. The opinion, of some astronomers of the former century, that the side of the moon turned towards the sun should be subjected to great heat, is sufficiently refuted by the observation of the effects of the sun on our mountain tops above the snow line referred to.

These arguments serve to show the incapability of the sun to prevent the cooling down of the planets and satellites under its influence. In fact, our whole planetary system is an illustration of this simple law of caloric radiation: that the smallest bodies will require the shortest time to cool down, while inversely, the largest will remain hot the longest. The smallest planetary body, with whose physical condition we are acquainted, is the moon, and this has cooled down far below the freezing point. The next planetary body, the only one, in fact, with which we are intimately acquainted, is our earth, and this has cooled down, exactly so far as to allow the solar radiation to develop vegetable and animal life on its surface; and a similar condition may perhaps exist on the surface of the planets Mars and Venus, not differing much in size from our earth. When we, however, look at the larger bodies of our planetary system, say Jupiter, which surpasses our earth in size more than 12,000 times, we find a very different condition of affairs. In the first place, its density is only one third more than that of water; while the density of our earth surpasses that of water five times. This proves from the outset that matter is on Jupiter by no means in the same condition as on our earth; that probably it has a much higher temperature of its own, so high as to keep in a gaseous condition many substances which are liquid or solid on our earth. Very recent observations with the spectroscope and telescope combined have indeed proved this to be actually the fact, and that this planet, as well as Saturn, Uranus and Neptune, possesses so high a temperature as even to shine with, besides the reflected solar light, some luminosity of their own.

If, finally, we look at the central body of our planetary system, the sun, which surpasses Jupiter in the same ratio that Jupiter surpasses our earth, we find that the cooling process has advanced the least; in fact, the heat of the sun is still so great as to be entirely beyond our present means of estimating temperatures.

Human life and even the historical record is short, while the changes spoken of extend over such long periods of time as to be an eternity compared with them. No wonder, therefore, that the practical evidences are slight, so slight indeed that we should feel inclined to disbelieve such changes, and to accept a theory of perfect stability of condition. There are indeed some who adhere to this belief; but unfortunately for them, there looms up the geological record, proving stupendous changes from the time when the most excessive tropical climate prevailed at the poles; while, between the tropics, an excessive torrid zone and boiling ocean formed an unsurpassable barrier for the vegetable and animal life around the poles of each hemisphere. Before that time, there was a period that the earth's temperature was so high as to occupy four times its present bulk, and to be self luminous. Then perhaps the moon was cooled to the temperature possessed now by the earth and she may have been inhabited; a condition similar to that of Jupiter at the present day, where the moons may have inhabitants, though the planet itself cannot.

If these above conceptions are correct, worlds have their times of preparatory development, of youth, of manhood, and of decay. Jupiter is in its preparatory stage; our earth has passed its youth and is just entering into manhood; our moon has had its time of decay and is now a dead planet. This will continue, with the difference that, after millions of ages, these conditions will be shifted from one set of celestial bodies to another

THE NEW MANHATTAN MARKET.

One of the largest structures in the United States is the Manhattan market, situated between 34th and 35th streets and Eleventh and Twelfth avenues in this city. Its dimensions are 900 feet in length by 200 feet in breadth. Its foundations rest principally on piles driven to depths varying from 14 to 50 feet; on these, heavy beds of concrete are laid, above which, and level with the upper line of the foundation, the floor is placed. This is 160,000 square feet or over three acres and a half in extent. It consists of, first, a layer of concrete four inches, then two inches of asphalt, and finally a coating of Portland cement, one and a half inches in thickness. The latter is to be colored in various designs and all will be impervious to water. Drainways are provided on either side of the building, through which all refuse will be carried to the river as often as the water from the 1,000 Croton hydrants is allowed to play upon it. With such a flow, it is believed that the atmosphere and the market generally will be kept thoroughly pure and clean.

The walls are built of Philadelphia brick and light colored (Lockport) stone, the latter being used for trimming and for portions of the ornamentation. The architectural style of the building is what is known as the Lombard. The massive sides and roof are finely symmetrical, and it is claimed that they present some of the finest specimens of mason's and bricklayer's work in existence. On either front, the name of the structure and the date of the commencement of the work are inscribed.

From the walls rises the arch—of iron and slate—which forms the roof. The arch proper springs to an altitude of 135 feet, and extends to within 75 feet of either front. The ends of this archway are domelike in form, and the whole is covered with parti-colored slate, arranged in various figures and designs. The central tower of the building is 236 feet high, and will contain a clock, claimed to be the largest in the world, costing $37,000. The other towers are two on either of the façades, and two on the center line of the sides. All are to be of similar design, and to have dials small in size compared to that on the main tower. Eight elevations, constructed of iron and wood, and built along the crown of the arch, serve as ventilators. The windows are 1,500 in number and are on pivotal centers.

Between the walls and the inner line of pillars which sustain the roof and towers, there are to be ranged between ten and twelve hundred stalls, one half for wholesale and the other for retail dealers in meats and market produce generally, excepting only fish, for which another building is to be constructed. The larger of these stalls will be sixteen feet square, and the smaller, ten by eleven.

In addition to the main structure, which is to be opened to the public early in August, there are to be exterior roadways and a long dock constructed. A line of river steamers are building which, when completed, will be used for the delivery of orders to the shipping in the harbor, and to various predetermined points in Brooklyn and New Jersey, between which and the offices in the main building there will be telegraph lines. In addition to this, suitable positions are to be prepared for market gardeners and produce dealers from Long Island and New Jersey.

The cost of this great market enterprise, together with its docks and steamers, additional buildings, etc., is $2,000,000. Situated in a central position, it will be the great point of supply for the entire city. The structure forms one of the most conspicuous objects in New York, and is visible up and down the river at a distance of several miles.

SPONTANEOUS COMBUSTION.

During an investigation into the causes of a recent fire which broke out in a loaded warehouse in New York, the testimony showed that the fire originated in a case of silk twist, packed in a tight case, with two layers of thick paper and one layer of oilcloth between the inside of the case and the goods, thus wholly excluding the air from without. The goods had evidently been packed while damp, and, therefore, the heat of the weather favored the ignition in the manner supposed.

After the fire was extinguished, an effort was made to have the remainder of the goods removed from the premises, but it was not permitted. In the course of three days, fire was again discovered, and but for the promptitude and efficiency of the firemen, a heavy loss would have resulted. On investigation, it was discovered that this fire also originated in one of the same cases of silk twist, and was beyond question spontaneous.

The Fire Marshal is of opinion that goods packed like the above, no matter whether they be woolen, cotton, hemp or silk, are liable to ignite at any time when the atmosphere favors. In this case, it was shown that the goods had become valueless before the fire, as the process of combustion, which had been going on within the case, had made the silk so rotten that it could be broken with ease. It is believed that many vessels and places of business are destroyed by fire which originates in this manner.

CANAL BOAT TOWING BY ROAD STEAMERS.

We learn from the Troy *Whig* that a trial of Williamson's road engine "Enterprise" was recently made on the tow path of the Erie Canal between Albany and Port Schuyler. The machine is thirteen feet in length by seven feet wide, with an upright boiler. There is a double horizontal engine with two cylinders, each, with a ten inch stroke, enclosed in a box.

There are two driving wheels five feet in diameter, the tires of which are fifteen inches wide, covered with stout india rubber and protected by iron shoes about five inches wide and set about three feet apart. The steering wheel is three feet in diameter, with a tire twelve inches in width. The seat for the engineer is directly in front of the engine, which is managed by a double crank. On either side of this seat are water tanks, and in the rear are two coal bunkers. The machine can be turned on its own ground and works much the same as a velocipede. In hight, the engine is eight feet from the groudd to the top of the boiler. The smoke stack is hinged, so as to be lowered when passing under bridges. The engine is twenty-four horse power. Four boats, three loaded and one light, were hitched to the steamer and were propelled at the rate of about four and a quarter miles an hour. The first mile was made in thirteen minutes. The "Enterprise" is valued at $5,000, and was built about three years ago. It has worked successfully on roads, and the owners are confident of its success in canal boat towing.

The New York *Sun* remarks: "It is said that all who witnessed the trial were fully satisfied of the practicability of this plan of steam towage, and it appears that its economical advantages are very great. The pressure of steam required to enable the engine to draw three barges is ten pounds to the square inch, and that pressure can kept up with a consumption of one hundred and fifty pounds of coal per hour. By a careful comparison of the cost of towing three boats by the road steamer and one boat by horse power from Albany to Buffalo, in which interest, wear and tear, and all contingencies are taken into consideration, it is estimated that by the use of the road steamer the expense of towage would be $133.86 less for each boat than by horse power, while there would be a gain of four days in time. The usual time consumed in a trip between Buffalo and Albany is ten days; the road steamer would easily make it in six.

It may be that some system of water traction may be devised that will give even better results than these; but if not, it seems to have been fully demonstrated that the land tractor will do more than has generally been deemed possible Should it come into general use there can be little doubt that many improvements in its construction will be suggested by experience, and it is also probable that improvements will be introduced in the construction of boats which will reduce the resistance of the water and lessen the wash of the banks. At all events it is safe to assume that horse power on the large canals will eventually be generally superseded by steam, whether land or water traction is adopted as the substitute for the present system."

The steamer alluded to is known as Thompson's patent, in England where it has been brought into very extensive use, and has been subjected to the severest tests. Mr. Williamson is the owner of the patent for this country. An excellent engraving of the invention with full description will be found on page 319, Vol. XXI of the SCIENTIFIC AMERICAN. The capabilities of the engine for canal boat traction are there set forth. That it is well adapted to such a purpose, there can be no question.

LOOK OUT FOR THE METEORS.

On the 10th of August, unless the calculations of our astronomical *savans* fail us, the earth will pass through a ring of meteors—the remains of the comet of 1862—on which date those of our readers who are wide awake may expect a meteoric display of greater or less brilliancy. We give in another column a very interesting summary of Dr. Schellen's statements concerning meteors and the annual shower in August.

BECAUSE I AM SO LAZY.

An esteemed correspondent, who is a good writer, a good investigator, and who knows just what is useful and interesting for readers of the SCIENTIFIC AMERICAN, says that the only reason why he does not more frequently contribute to our columns is "because I am so lazy." This unfortunate condition besets thousands of the most useful people in the

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world, and in fact greatly hinders the mental and material progress of the human race. But it can be readily overcome, in every individual case, by a determined exercise of the will. We hope that our correspondent will turn over a new leaf, let us hear from him more frequently, and so set a good example to his fellow men in general and to other correspondents of our paper in particular, who are afflicted in the manner he describes.

STEAMSHIP NOTES.

Among the multitudinous shipping of New York harbor there is always occurring more or less of current interest from an industrial or technical standpoint. We cannot afford room for extended mention of all or even much of this, but some of the items are worthy of note, either as indices to commercial or engineering progress or as illustrations of the way things mechanical are sometimes managed. Of the kind last indicated is an incident that recently occurred to the *Great Western*, an English bluff bowed iron freight steamer on her first trip from Bristol to New York, laden with railroad iron. She had a four bladed propeller, but broke three blades on the voyage, and steamed into Gowanus with rather dilapidated propelling machinery. She carried the usual spare propeller, and on her arrival here was taken to the Erie docks to have it put on in the place of the old one. The usual method of removing a screw from its shaft is to drill a line of holes in the boss and then split it open. But in the present instance, the plan was adopted of removing the keys, taking off the nuts, and driving it off. While doing this, the other propeller was being hoisted out of the after hold. While being swung aft, the lashings broke and the ponderous apparatus fell, one blade going through the dock and another breaking off. This left the parties with a one bladed screw on the shaft and a three bladed one in the mud. All things considered, it was thought best to cut off the one blade of the former to correspond with the diminished length of the broken ones thereof, and so the vessel has started back with her jury screw. Had the affair been under Yankee management, possibly the spare screw would not have been broken, but if it had, there would have been ingenuity enough somewhere about the shop to have lengthened the broken blade with a wrought iron plate.

Nevertheless, however much we may justly claim superiority for inventive skill and adaptiveness, we have to make painful mention of British energy, shown in the progress of iron shipbuilding in England, a branch of industry which we hope to see returning to our own shores. For example, the Anchor line, hitherto almost wholly devoted to freight between New York and Glasgow, is about to increase their previously limited passenger traffic by the addition of new and superior steamers. The company is now building, on the Clyde, seven new vessels which, with those now running, will aggregate forty-three.

While upon the subject of steamers, we may speak of a pair of what may be termed historic marine engines, one of which is lying dismantled at the Continental Iron Works, while the other is doing duty in the *James Adger*. These engines were splendid examples of marine steam engineering, and drove the paddlewheels of Commodore Vanderbilt's famous steam yacht the *North Star*, in which he voyaged along the coasts of Europe a score of years ago, and which, if we remember rightly, so alarmed the officials of the port of Civita Vecchia that they ordered her off. These engines were of the vertical beam variety, of about 1,000 horse power each, with sixty inch cylinders and ten feet stroke. The one at the Continental Iron Works has some of the smaller portions missing; the bright parts are painted over, and it will doubtless some time find an obscure use as a stationary motor. The *James Adger*, in which the other was placed when removed from the steam yacht, will be remembered as the vessel employed in laying the first cable between Newfoundland and the mainland.

The Erie Railway is having built at Chester, Pa., a new iron ferry boat, said to be the first ever designed to cross the North river. The following are the dimensions: length between perpendiculars 180 feet, over all 190 feet. Beam over hull, 36 feet. The depth of the hold 13 feet 6 inches. The power will be furnished by a beam engine with a forty six inch cylinder and eleven feet stroke. The diameter of the paddlewheels is 22 feet and their faces 8 feet, 4 inches. The keel instead of being brought up inside the rudder to form a stern, as in the usual method of construction, is extended beyond the ends of the hull and made to form a rudder guard at each of the ends. The plates at the water line have a thickness of nine sixteenths of an inch, increased at the bows to ten sixteenths. The vessel is to have watertight bulkheads up to the main deck, and is to have iron paddle beams, that is, those supporting the guards at the ends of the paddle boxes. The spring beams which support the outboard bearings or ends of the paddle shaft are also of iron. The keelsons are box keelsons of heavy plate iron, arranged to distribute the weight of the engine upon the bottom. The carriage ways on deck are eleven feet in width. The bows are to be protected by extra framing as well as by the increase herein before referred to in the thickness of the plates. A drop return flue boiler will be put in, as is the case with nearly all or every ferry boat in New York waters.

BRIGHT'S DISEASE.

The medical profession generally divide this terrible disease of the kidneys into two forms, the acute and the chronic. The acute form is a simple congestion of the filtering tubes through which the kidneys perform their organic duty. The chronic form occurs when, through neglect or repeated attacks of congestion, granular degeneration, bringing with it structural alteration of the organ, has supervened. The first is curable; the second, though it may be temporarily alleviated, is fatal.

The New York Times publishes some valuable statistics, extending over a period of three years, which show that the disease is more rife in certain sections of this than in other countries, especially in New York city. During the first year covered by these statistics, the ratio of deaths from Bright's disease to the total number of deaths taking place in that period was as 1 to 66, the following year as 1 to 55, and the third year as 1 to 42. Comparing these figures with the ratios in other cities, we find that in Boston it is as 1 to 93, Rochester as 1 to 73; and in the old world, in London as 1 to 89, in Glasgow as 1 to 142, in Paris as 1 to 266.

It is considered that the prevalence of the disease in this country is due to two leading causes, climate and intemperance. The experiments of scientific men have shown that alcohol is partly cast off from the system, unchanged, through the kidneys. When alcohol is taken to excess, the circulation in the kidneys is disturbed and irritation and congestion ensue. Wine and beer, although exercising no beneficial effect on these organs, do not tend invariably to injure them, but rather to induce gout. Few are aware of the immense quantity of alcoholic liquors yearly consumed in New York From the 1st of May 1870 to the 30th of April 1871, 7,440 licenses were issued for the sale of intoxicating liquors, the annual fees on which amounted to $340,141.91. Estimating the population of the city at 1,000,000, there is one liquor saloon for every 134 inhabitants, men, women, and children. If all the liquor saloons in the city could be placed side by side they would extend a distance of 26 miles; or if situated on Broadway, they would reach the whole length of the street from the Battery to the end of the island, covering both sides of the way. Deducting the women and children who do not drink, an enormous quantity of liquor must be annually consumed by the remaining men in order to support 7,440 saloons. Whisky is the ordinary beverage drunk, and its effect on the kidneys is shown above. The records of the New York Hospital show that over fifty per cent of the cases yearly admitted for treatment were caused by intemperance in the use of alcoholic beverages.

The trying nature of our climate is another prolific cause of this disease. It has been demonstrated that the malady is confined to that part of the earth in which the change of seasons is most marked, and where the annual mean temperature of the air ranges between 46° and 57°. In the extreme northern part of this continent, where cold is the normal condition of the atmosphere, and in the Southern States, where heat is the normal condition, the disease is but little known. In Bombay, the proportion of deaths is 1 in 2,800; in New Orleans it is 1 in 329, and in Providence, where cold is more prevalent than in New York, 1 in 173.

The acute form of Bright's disease may be produced by any sudden chill of the system, undue exposure, or rapid change of temperature. Unseasonable changes of garments and rapid checking of perspiration both tend to bring it on. It is also induced to a certain degree by gout or disease of the heart; one or two trades are particularly liable to it, especially those who work in lead.

A careful study of the causes of the disease, together with the consideration by the facts advanced above, show plainly that vast numbers of persons who now suffer and die under it need never have known such an affliction. Care in keeping themselves warmly clad, avoidance of sudden chills and reckless exposure, and the observance of the simple rules of temperance, would have saved hundreds from premature graves.

THE BLACK ROCK BRIDGE OVER THE NIAGARA RIVER.

For three years past, both American and English engineers have worked to lay the foundations for the international bridge for the Grand Trunk and Great Western Railroads, at Black Rock, 4 miles below Buffalo, across the Niagara River, to Canada. The entire length of the structure is to be 1,400 feet, consisting of iron spans resting on eight abutments. The tremendous current in the river which rushes toward the falls has rendered the work one of unexampled difficulty. Caissons and foundations have been sunk and immediately swept away by the torrent, while the river banks below are strewn with the *débris* of wrecks, showing a loss of millions of dollars.

The entire past year has been unsuccessfully devoted to attempts to erect the three middle piers in a depth of from thirty-five to forty feet of water. Mr. Otto Meyer, of New York, who last winter was engaged to prepare and sink coffer dams, has finally, however, succeeded in sinking one dam so that the work on its enclosed pier has been commenced. The length of this dam is 125 feet, width 32 feet, and depth, to suit the river, 36 feet. It is sharp on both ends, has double sides, closing at the bottom, forming a space three feet wide around the sides for depositing stones, leaving the center of the dam open for the caisson in which the pier is afterwards built. Eight of the largest anchors and chains from New York and Montreal being secured, one the 13th instant the "ship without a bottom" lay formerly moored six feet above the position of the pier to be built.

Preparations were then made for sinking several hundred tuns of stones, which were thrown in the apertures on the sides of the coffer dam until it had sunk to within eighteen inches of the river bed. A number of barrels had been arranged previously under water and fastened on the woodwork, their buoyancy lifting the structure about two feet; these were all held by one rope, which being cut, caused the barrels to float and submerge the coffer dam deep enough to strike the bottom. Six very heavy iron-pointed posts or "spods," running through sheaths or sockets, three on each side, were hoisted and ready to drop.

Everything being ready on shore and on board, the craft was quietly let "down stream" by her anchors until the engineer on shore signalled "in position." The flag was raised "all right," and with the order "cut away," the barrels floated up, the iron spods dropped, burying themselves in the river bed, and with a light shock the coffer dam rested securely on the bottom of the Niagara, on a deposit of gravel and stones. The gravel and stones have to be removed by a dredge, there ready for the purpose. Below the gravel the solid rock is found on which the piers are to rest.

Three divers from the new Blackfriars Bridge, London, are clearing away the obstructions around the shoeing. They now and then come in contact with pieces of wreck and sunken logs. Until the bridge is finished, the large steam ferry, near Buffalo, continues taking the trains across Lake Erie to the Canada landing.

THE AMANIANS.

The Amania Society is the name of a very flourishing community in Iowa, consisting of fifteen hundred members. They own everything in common, and present an admirable example of the success of the co-operative plan when intelligently administered. These people were formerly known as *Ebenezers*, and lived near Buffalo, N. Y., where they possessed six thousand acres of land. They sold out some fifteen years ago for the sum of five millions of dollars, and moved to Iowa. They are located near Homestead station on the Rock Island and Pacific Railroad, where they own thirty thousand acres of the choicest lands. They have seven distinct settlements, and their affairs are managed by fifteen trustees or fathers. The society is incorporated under State laws. At convenient distances in the settlements they have restaurants, to which the various families resort for food.

The Amanians cling to their good old German ways in dress and general habits, and are not in bondage to the outside world. All have an equal interest in the property; individuals are not allowed anything for their services, or furnished with money for their private use. Each settlement has a store, and all are allowed to draw a certain amount yearly from it for their private wants. A man with a family is allowed from $50 to $70, with $20 for his wife and $10 for each child. This is expected to keep them in clothing and household furniture and supply all their little personal needs. When persons find that the amount appropriated is not sufficient for their actual expenses, the matter can be laid before the Board of Trustees, who will exercise their judgment about making an additional appropriation.

They are a temperate, industrious, religious people, but it is difficult to define their theological views.

A leading principle of the society is that all will get along well together if every one will do right; and in this spirit, everything is managed harmoniously. There is no better theology than this, after all.

It is their custom to meet every day in small companies, about the settlement and in rooms provided for the purpose, to devote half an hour to religious exercises; on Wednesday they meet in the middle of the day; Sundays they all come together in their meeting house for religious services. They do not appear to specially favor marriage, and many of them are living single. When young people wish to marry, they generally receive the consent of the society if they have a reputation for good behavior. If the parties have not succeeded in commending themselves, they are not allowed to marry.

The society owns the whole settlement, and carries on all the business, including that of the lumber yard, store, hotel, etc. They hire considerably on their farm and in their factories, and claim that even in Iowa, with their 30,000 acres of choice land, farming operations do not pay. About three miles from Homestead, on the Des Moines river, they have a fine water power, flouring and woolen mills, and manufacture an extra quality of yarns and fine flannels in colors. The latter goods stand high in market, and are mostly bought up by a few first class retailers in the large cities. The Amanians have a high reputation for uprightness in all their dealings with the outside world, and are much respected.

[Special Correspondence of the Scientific American.]

LETTER FROM PROFESSOR R. H. THURSTON.

PITTSBURGH, Pa., July 2nd, 1872.

Construction of Iron Bridges. Works of the Keystone Bridge Company. Manufacture of glass ware. New iron works. The coal and iron fields. The Siemens furnace.

At the upper part of the city and near the bank of the Allegheny, are the works of the Keystone Bridge Company, where are made a large number of the finest bridges in the country, and where is now in progress the superstructure of the great St. Louis bridge over the Mississippi. About three hundred men are employed here, and an immense amount of bridge work is turned out. The character of the work done at this factory has secured for the firm a reputation that can hardly be affected by anything that we may say; they are everywhere known as the builders of one of the best forms of bridges in use, and as giving the best possible work.

Many tools in use here were designed especially for their work, and are remarkable both for their ingenuity of design and for their simplicity and effectiveness.

In all the bridges built by this company from their own designs, the bolts and links are "upset" at their ends to take the thread or to form the eye; and this work being done

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in a powerful machine at a single heat, the utmost economy of material and greatest possible strength of connections are obtained. This is one of the most noticeable peculiarities of their bridge.

THE ST. LOUIS BRIDGE.

The work on the St. Louis bridge is going on finely and is well done. Every piece is carefully tested before it is put into the structure, the fits are well made and a careful inspection finally insures the rejection of any piece faulty in either construction or material. The "skewbacks" are very awkward shapes to forge and are very heavy. They are furnished by several of the larger forges of the country. Those that we examined were made by Lazell, Perkins and Co., of Bridgewater, Mass, and were well executed.

MANUFACTURE OF GLASSWARE.

As was remarked in an earlier letter, the glass manufactures of Pittsburgh are very important and extensive. A large number of firms are making window glass, and the remainder are generally making a lime glass of such excellence that it requires an expert to distinguish it from flint. It is sometimes called a flint glass, but is made without lead, which was formerly supposed indispensable in the manufacture of a very clear glass. This lime glass lacks the weight and the metallic ring of true flint glass, but, if well made, compares very favorably with it in other respects.

We visited the establishment of W. A. Hamilton and Co., who were making druggists' prescription bottles of a good quality of lime glass, and we were much interested in watching the operation. The great beehive-shaped furnace, with its ten glowing pots and the forty or fifty men and boys clustering around it and hurrying to and fro, was a novel and entertaining spectacle. The skill displayed by the workman in taking from the liquid mass just the right quantity of melted glass upon the end of his hollow iron rod, in blowing it up to just the proper form and size to fit the mold and the rapidity with which the work was done were equally remarkable. The reheating of the necks of the bottles at the "glory hole" and nicely finishing the lip formed an appropriate side show.

A large proportion of the furnaces are now blown out for repairs. This requires some weeks, and the furnaces being rebuilt, their fires are lighted and are not extinguished until another year brings around again the season for repairs.

The O'Hara Glass Works, conducted by Messrs Jas. B. Lyon and Co., were formerly noted as the makers of the best flint glass manufactured in this country. They are now making a lime glass and are sustaining their reputation by the excellence of the new product. These were among the earliest glass works started in the United States, and were established by General Jas. O'Hara and Major Isaac Craig, in 1795, first making window glass. They began making flint glass in 1802. They have made their reputation, and are sustaining it, like the best iron masters of the place, by steady attention to the choice of the best materials and by doing the best possible work upon them, and then by a thorough system of inspection which prevents any, except perfectly satisfactory products, going into the market. Some of the cut ware made here is very beautiful. This work is done by grinding, the work being held in the hand of the workman; and the skill displayed in cutting the most delicate patterns is frequently perfectly marvelous, and appears the more astonishing when it is noticed that the work is done by no more elaborate apparatus than a little metal wheel, running with emery as the cutting material.

The molds in which the pressed articles are formed are quite remarkable specimens of metal work. They are cast frequently in several pieces in order that the article may be withdrawn from them when made, and the ingenuity displayed in concealing the joints, and the patience and the skill exhibited in giving their inner surface a perfection of polish, are equally notable.

COAL AND IRON DEPOSITS.

An excursion up the Monongahela to McKeesport, where a Boston firm are erecting extensive works in which to make iron tubes, afforded an opportunity to enjoy the beautiful river scenery above Pittsburgh, and some of it was very picturesque, and also to explore one of the coal mines from which comes the Pittsburgh coal. The deposits are usually several feet deep in thickness—averaging perhaps four feet and over—as level as a floor, and at sometimes a considerable hight above the river level. The mining is easily and safely carried on, the veins being of good hight and the rooms having a good floor and roof. The coal is loaded into cars where the bed outcrops on the river bank, and is let down inclined planes and dumped directly into the boats and barges which carry it down to the city or to ports lower down the river. It would be difficult to imagine how Nature could have more conveniently arranged these great deposits for the use of man. None of the expense and danger is incurred here, that attends the sinking of deep shafts and the hoisting of coal to the surface that is generally necessary elsewhere, and there is comparatively little expense for transportation where, as here, the coal is dug from the river bank itself.

There are 15,000 square miles of these coal fields; $15,000,000 of Pittsburgh capital is invested in mining and probably $25,000,000 in transportation, while the total of all interests dependent upon these coal fields cannot fall short of the enormous sum of $100,000,000.

Neither time nor space will admit of a description of our visit to the mill of Schoenberger and Blair, where we saw the best iron sponge—made directly from the ore by Mr. Blair's process—that we have seen anywhere, or to the Superior Mills, where we found probably the best arranged iron rail ing mill in the United States,

THE SIEMENS FURNACE.

We cannot describe the Siemens furnace that we saw in such common use where high temperature or economy of fuel was desired, nor even refer to the beautiful application, which the inventor has made in it, of well recognized scientific principles and of as well known practical engineering facts; and we must even omit a description of what we saw at the Allegheny observatory, where Professor S. P. Langley has arranged for the regulation of the time of the great Pennsylvania railroad and its branches by electrical clocks connected with his own standard at the observatory—the widest "distribution of time" in the world already, and in a fair way to be much further extended by the energetic astronomer who has commenced the work. The ten days of our visit were quite insufficient to satisfy our desire to thoroughly explore even a small number of the numerous interesting engineering establishments, or to witness the many attractive sights about this great human beehive. We must leave all until our good fortune shall offer an opportunity to revisit this place, and hurry westward and northwestward to see where the iron ores generally used here are obtained and how they are mined, and to see some of the great deposits of copper which feed our markets. R. H. T.

SCIENTIFIC AND PRACTICAL INFORMATION.

FIREWEED FIBER.

A plant, yielding a fiber capable of being spun and woven, called the *epilobium* or fireweed, has lately attracted the attention of manufacturers. It is very similar to the cotton plant, but the seeds are smaller and no ginning is required to separate them from the boll. Wicks, ropes, yarn, and even paper have been made from it, the last named application being especially successful, the product almost equaling the silk-made paper of China and Japan. The most valuable characteristic of this plant is stated to be that it will grow in any soil, and it is said to have appeared spontaneously in evergreen covered lands which have been burnt over.

PREPARATION OF SILK.

Silk in its raw state, as spun by the worm, is either white or yellow, of various shades, and is covered with a varnish which gives it a stiffness and a degree of elasticity. For the greater number of purposes to which silk is applied, it must be deprived of this native covering, which has been long considered to be a sort of gum. The operation by which this coloring matter is removed is called scouring, cleansing, or boiling. Nothing agrees so well with the nature of silk and preserves its brilliancy and suppleness so perfectly, so far as European experience goes, as a rapid boil with soap and water. It appears, however, that the Chinese do not employ this method, but something that is preferable. Possibly the superior beauty of their white silk may be owing to the superiority of the raw material.

To produce the China white, a little annatto is mixed with the soap water, so strong as to lather by agitation, and the silk is passed through it. As to the other shades, they have only to be azured more or less with a fine indigo, previously washed in hot water and reduced to powder. After being withdrawn from the bath, the silk is introduced into the sulphuring chamber, if it is to be made use of in the white state. The silks intended for the manufacture of blondes and gauzes are not subjected to the ordinary scouring process, because it is essential in these cases for them to present their natural stiffness. For these the manufacturer selects the raw silk of China, or the whitest raw silk of other countries, which are steeped and then rinsed in a bath of pure water, wrung and exposed to the vapor of water, and then passed through the azure water.

The dull silks, says the *British Trade Journal*, in which the varnish has already undergone some alteration, never acquire a fine white, unless they are exposed to sulphuric acid gas. Exposure to light has also a very great effect in whitening silks, and is had recourse to, it is said, with advantage by the Chinese. The Chinese prepare their silk with a species of white beans, with some wheat flour, common salt, and water in the respective proportions of 5, 5, 6, and 25. It is difficult to discover what chemical action can occur between the decoction and the varnish of raw silk; possibly some acid may be developed which may soften the gummy matter and facilitate its separation.

A RAILWAY tunnel under the Mississippi river at Memphis, Tenn., is projected, to cost five millions of dollars.

A CUBIC foot of air weighs 523 grains. A cubic foot of water weighs 1,000 ounces.

THE POPULAR SCIENCE MONTHLY, No. 4, for August, contains a variety of interesting scientific articles, collated principally from foreign magazines and other publications. To those who cannot conveniently find access to the original sources, these compilations will prove valuable. The editor, Professor E. L. Youmans, is well known as a lover of science, and as an indefatigable worker in the promulgation of useful knowledge.

Facts for the Ladies.—Miss H. W. Terry, Wading River, N.Y., has used her Wheeler & Wilson Lock-Stitch Machine almost constantly for 5 years, on all kinds of family sewing, and broken but one needle. See the new Improvements and Woods' Lock-Stitch Ripper.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed four Lines, One Dollar and a Half per Line will be charged.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 17c. a line.

Cheap Engines for Sale by Brady & Logan. See page 93.

In the Wakefield Earth Closet are combined Health, Cleanliness and Comfort. Send to 36 Dey St., New York, for descriptive pamphlet.

Callow's New process of Graining Oak, Walnut, Chestnut, Rosewood, &c., with Metallic Therom Graining Tools, patented July 1 1870, does triple quick work, first class imitations, is durable, and makes every man his own Grainer. Address, with stamp, J. J. Callow, Cleveland, O.

Forty-five horse Engine, Lathes, Drills, three inch Shafting, with assorted Pulleys, and other iron working Machinery and Tools, in Brick 4 story Factory, for sale low, with or without Building. Easy rail and water distance from New York. Address Box 1,203, New York.

Lenoir Gas Engine—Wanted, the address of any agent in this country of the Lenoir Gas Engine, or of any person who has one imported within two or three years. Address, F. R., Box 498, Newport, R. I.

Platina Plating—Alb. Lovie, 729 N. 3d St., Philadelphia, Pa.

Gear Wheels, for Models; also Springs, Screws, Brass Tube, Sheet Brass, Steel, &c. Illustrated Price List free by mail. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Brick and Mortar Elevator and Distributor—Patent for Sale See description in SCI. AMERICAN, July 20, 1872. T. Shanks, Lombard and Sharp Streets, Baltimore, Md.

The Berryman Manf. Co. make a specialty of the economical feeding and safety in working Steam Boilers. Address I. B. Davis & Co. Hartford, Conn.

The Berryman Heater and Regulator for Steam Boilers—No. one using Steam Boilers can afford to be without them. I. B. Davis & Co Hartford, Conn.

Wanted—An Engine Belt 76 ft. long, 19 inches wide; either new or second hand. Address P. O. Box, No. 237, Buffalo, N.Y.

Wanted—Two good machinists used to Lathe, Planer, and Bench work. Steady employment and good pay for the right men. Address, stating terms, age, &c., Oneida Community, N. Y.

Wanted—Melter. Permanent situation, at good wages, to a good, experienced Iron Melter. Address C., Iron Founder, Cleveland, O.

Tested Machinery Oils—Kelley's Patent Sperm Oil, $1 gallon; Engine Oil, 75 cts.; Filtered Rock Lubricating Oil, 75 cts. Send for certificates. 116 Maiden Lane, New York.

Kelley's Chemical Metallic Paints, $1, $1·50, $2 per gallon, mixed ready for use. Send for cards of colors, &c., 116 Maiden Lane, N. Y.

Kelley's Pat. Petroleum Linseed Oil, 50c. gal., 116 Maiden Lane.

Second hand Saws and Mandril for Sale—one 46 inches diameter, used six weeks in cutting Georgia Pine Flooring--one 52 inches, never been used. H. A. Crane, foot W. 30th St., New York.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro, 414 Water st., N. Y

It is better to purchase one of the American Twist Drill Company's Celebrated Patent Emery Grinders than to wish you had.

New Style Testing Machines—Patented Scales. Send for New Illustrated Catalogue. Riehlé Brothers, 9th and Coates Streets, Philadelphia, Pa.

Flouring Mill near St. Louis, Mo., for Sale. See back page.

State Rights on improved Cigar Moulds for Sale. Patented June 25, 1872. Inquire of Isaac Guthman, Morrison, White Side Co., Ill

For Machinists' Tools and Supplies of every description, address Kelly, Howell & Ludwig, 917 Market Street, Philadelphia, Pa.

For 2, 4, 6 & 8 H.P. Engines, address Twiss Bro., New Haven, Ct.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

The best recipes on all subjects in the National Recipe Book Post paid, $2.00. Michigan Publishing Company, Battle Creek, Mich.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

We will Remove and Prevent Scale in any Steam Boiler or make no Charge. Two Valuable Patents for Sale. Geo. W. Lord, Phila., Pa.

For Hydraulic Jacks and Presses, New or Second Hand, send for circular to E. Lyon, 470 Grand Street, New York.

An inducement.—Free Rent for three months to tenants with good business, in commodious factory just built for encouragement manufacturing. Very light rooms, with steam, gas, and water pipes, power elevator, &c. &c. Manufacturers' Corporate Association, Westfield, Mass. Plans of Building, Room 22, Twenty One Park Row, N. Y.

For Marble Floor Tile, address G. Barney, Swanton, Vt.

Old Furniture Factory for Sale. A. B., care Jones Scale Works, Binghamton, N. Y.

Walrus Leather for Polishing Steel, Brass, and Plated Ware. Greene, Tweed & Co., 18 Park Place, New York.

Pattern Letters and Figures, to put on patterns, for molding names, places and dates on castings, etc. H. W. Knight, Seneca Falls, N.Y.

Steel Castings to pattern, strong and tough. Can be forged and tempered. Address Collins & Co., 212 Water Street, New York.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N.Y.

Portable Baths. Address Portable Bath Co., Sag Harbor, N.Y

Extra Heavy Oak tanned Belting—Rubber Belting, Packing, Hose, &c. Greene, Tweed & Co., 18 Park Place, New York.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

Diamond Carbon, of all sizes and shapes, furnished for drilling rock, sawing stone, and turning emery wheels or other hard substances also Glazier's Diamonds, by John Dickinson, 64 Nassau st., New York.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1809.

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

Better than the Best—Davis' Patent Recording Steam Gauge Simple and Cheap. New York Steam Gauge Co., 46 Cortlandt St., N. Y.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

For hand fire engines, address Rumsey & Co., Seneca Falls, N.Y

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies, see Manufacturing News of United States in Boston Commercial Bulletin. Terms $4.00 year.

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To Excel in Improvement is the leading element of this country, and no other article of labor-saving machinery has equalled in this respect the sewing machine in rapid strides of improvement. Among them the New Wilson Under-Feed Machine may be counted the leading one in this connection. Mr. W. G. Wilson, its inventor, and President of the Company that manufactures it, makes its improvement his constant study. Everything has been added to it that constant experimenting and science could suggest, and it is offered to the public to-day without an equal for family use. Light, rapid, beautiful, durable and perfect, the Wilson holds the leading place among the best sewing machines in use. Salesroom, 707 Broadway, New York; also for sale in all other cities in the United States.

Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.

1.—FLY PAPER.—Will any one give me a recipe for making the paper that, if flies alight upon it, they stick to it?—T. W. S.

2.—STRENGTH OF CITRIC ACID.—How much citric acid equals one dozen lemons?—T. W. S.

3.—PATENT LEATHER.—What composition is used for glazing patent leather, and how is it put on?—S. B. D.

4.—WHITE INDIA RUBBER.—Is there any way in which ndia rubber can be made perfectly white, without destroying its elasticity?—M. H. J.

5.—WIRE FOR SIEVES.—What kind of a wire sieve will withstand the action of salt and guano? Iron sieves or wire will do only for a few days; then they are rusted out and worthless.—A. C. S.

6.—TEETH IN WHEELS FOR CHAIN BELTS.—Will some one inform me of a rule for laying out or spacing off teeth in wheels for chain belts to run on? Different wheels require different spacing for the same chain.—M.

7.—GRINDING LENSES.—I wish to make a powerful lens for a microscope. The one I have is not strong enough. Can some one tell me how I can turn and polish the glass?—E. J. O.

8.—CENTERING LATHES.—How can the conical points of the centers of lathe arbors be ground so that their cross sections shall not vary from circles by more than one ten thousandth part of an inch?—G.M.T.

9.—JAPANESE PAPER WARE.—Can any one tell me how his is made, or put me in the direction to acquire the information?—E. A. W.

10.—PERMANENT ANILINE INK.—Can I make permanent nk from aniline colors? I dissolved rosaniline in alcohol, and to get the proper tint, I mixed it with water and gum arabic. It is a splendid ink, but after a time it fades and washes away.—C. J.

11.—ANATOMICAL SPECIMENS.—How can I prepare anatomical specimens such as are seen in museums? They look as if they were dried.—G. H. J.

12.—COMPRESSIBILITY OF WATER.—Supposing you put water under a pressure of one, two, or three atmospheres; in what proportion does the volume of the water decrease and the specific gravity increase?—L. E.

13.—MAGNETIC CURRENTS.—Will Mr. John Wise the aeronaut, or some other experienced philosopher, inform me whether there is any perceptible variation in the line of magnetic currents, when we rise above the earth, as indicated by the compass?—A. E.

14.—IMPURE WATER.—Owing to the continued drought, the water in the storage lakes supplying our city has become very much reduced, and the water now has an unpleasant taste and smell. What can be put in our pitchers, etc., to purify before using?—J. W. L.

15.—REFRIGERATORS.—Can any one give me general information as to refrigerators? I want to make one on a small scale for family use, and would like to know the materials used and their cost. Would the money required to build an ice house and the labor spent in filling it be as well laid out in a refrigerator?—W. A.

16.—ENGINE FOR GANG PLOWS.—Could not an engine be built of small power with elevating screws for the boiler, to keep it on a level, and so enable it to be controlled for the purpose of breaking prairie with two or more plows in gang?—A. J. D.

17.—POWER FOR STEAM YACHT.—I am about to build a screw propeller steam yacht, 30 feet long by 10 feet beam. What is the smallest single engine that can be used to run it 15 miles per hour? What ought the diameter of the screw to be, and how many revolutions ought it to make per minute?—W. S. B.

18.—DRYING FRUIT.—Can the heat of the sun be stored up to be used during the night? One of the great wants of the West is a cheap and convenient method of drying fruit. Could the sun's and the waste heat from the cooking stove be so stored that little fuel would be required?—E. E. S.

19.—COFFEE USED IN DYEING.—I saw a statement some time ago in a paper (now mislaid) that a large quantity of coffee was used in the process of dyeing; it was submitted to a hot bath by which certain properties were extracted, then dried and sold for food. Please inform me how I may distinguish the genuine from the adulterated grain.—S. E. M.

20.—FETID WATER.—The water in my cistern has a very disagreeable odor; what can I do to remedy it? On standing a few hours in an open vessel, a scum rises to the top resembling iron rust in color. The cistern is new and so set as to receive no surface water; the roof is also new and is not shaded by trees. Three ordinary iron pumps which are used constantly are attached. The top is kept covered.—F. D. H.

21.—TINNING IRON.—Can any one, familiar with processes or tinning iron, tell me if glycerin will do for dissolving sal ammoniac or muriatic acid, so that the articles when properly cleaned can be dipped from this preparation into the melted tin? I have used a solution of sal ammoniac in diluted muriatic acid, and dipped the articles in powdered rosin before dipping into the tin. I have also used melted tallow instead of powdered rosin, but I wish to use something which is easy to remove from the articles after tinning, and which will not rust iron nor injure silver plate.—W. S. H.

22.—PRIMING OF BOILERS.—I have a boiler ten feet long with 40 two inch flues and a steam dome on top; the engine is estimated at 30 horse power, with 60 pounds of steam. As sure as we let steam get down to 50 pounds, the water gushes out at the safety valve and the cylinder chokes. Can you explain to me the trouble? I contend that the pipe from the engine is too long; it is 12 feet, and consequently I think it gives room for the steam to condense.—S. M. P.

23.—RED ANTS.—In your issue of July 20 is an item informing the public that red ants throw out a liquid substance from their bodies. Now tell us, gentlemen, how we can throw out the red ants altogether from our cupboards. How shall we be rid of the red ants themselves? Salt has been said to be an antidote, but a trial of it proves that salt don't scare worth a cent. What will do it?—J. C. W.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1·00 a line, under the head of "Business and Persona."

ALL reference to back numbers must be by volume and page.

MADRAS WATER WORKS.—J. S. L.'s Madras *Athenæum* has not come to hand.

A SHOWER OF POLLEN.—A. V. P., of Mich., says: We had a heavy shower yesterday, and with the rain there fell a large quantity of the yellow powder, a specimen of which I enclose. The impression here is that it is sulphur. One person claims that it is the sulphur that would have been burnt up had the cloud been accompanied by lightning. I have tried to burn it, but it does not burn; therefore I conclude that it is not sulphur. Thinking you might be interested, I send a sample. Answer: The substance sent is the pollen of a species of pine. A representation of the particles as they look under the microscope may be seen in Wood's "Botany," page 103, Fig. 367. Showers of pollen and *infusoria* are not uncommon, and are always interesting phenomena. The daily papers recently reported the fall of a shower of yellow sulphur at Saratoga Springs during a rain. But it was probably pollen, as above.

MINERAL SPECIMEN.—Enclosed I send you a stone, or something else found among hundreds of others in a small stream of water. They are not all alike. It is very hard indeed. Is it of any value? Answer: The specimen is a quartz pebble. No stone which will yield to the file and grindstone can be diamond. Quartz pebbles, when large and perfectly clear, are used by opticians.

UTAH OBSIDIAN.—I see a little notice on the African diamond fields. Please tell me whether, in those fields, Mr. Paterson has seen multitudes of the dark colored stones of which I send you herewith a specimen. When I found them (on top ground like gravel, and plentiful), I thought of Brazilian diamond fields. I have also seen them on marly soil and metamorphous clay slate shales and green sandstone, mixed with blendish formations of all colors. I had no time to lose, or I would have spent a week to dig and wash the marly ground. But if there be such stones in the African regions, I have every reason to believe I found similar fields here in Utah.—S. Answer: The specimens sent are of volcanic origin. The black is obsidian or black gloss lava, which often occurs in nodules in river sand in Mexico and elsewhere. The other is a known variety. They are interesting to the mineralogist, and are sometimes used for jewelry, but they have an indifferent value. We were not aware that Mr. Paterson found obsidian in the African diamond fields.

STEAM AND COMPRESSED AIR.—To C. B. B.—Compressed air may be used in place of steam to work an engine.

HEATING FEED WATER FOR LOCOMOTIVES.—To A. M.—Several devices have been employed for the purpose; but we cannot say which would be most suitable for your engine.

BOILER SCALE, ETC.—S. M. P. should consult our advertising columns. As an "Engineeer's Guide," Bourne's "Catechism of the Steam Engine" is a good authority, and may be studied by beginners.

STAG HORN BEETLE.—I send you a horned bug for inspection, as I see, by the SCIENTIFIC AMERICAN, that you write a chapter on such things occasionally. These bugs are numerous towards night.—J. F. W. Answer: The bug is the stag horn beetle or *lucanus dama*. Its larva or caterpillar has a rusty colored head, and lives in rotten wood.

G. H. C., of Conn., sends some mineral specimens, requesting to know their character. We reply: The golden spangles in the quartz rock are pyrites. The black specimen appears to be tourmaline, but the fragment is too small for safe determination.

SOLID AND HOLLOW IRON SHAFTS.—Which would sustain the greater weight, a solid cylinder of iron two inches in diameter and two feet in length, or a hollow cylinder of two inches external and one inch internal diameter of the same length? Each is supposed to rest horizontally, supported at the ends, and the weight rests upon, or is suspended from, the middle of each cylinder.—S. S. Answer: Assuming that average castiron be the material employed, the quiescent breaking load of a solid cylinder of the specified dimensions would be about 5,040 pounds, while that of a hollow cylinder would hardly exceed 3,308 pounds.

L. S. F., of O.—The issue of June 22d closed the volume of 26 numbers commencing January 1st. The next issue was dated July 6, no intermediate paper being issued.

PRINTING QUESTIONS.—To M. W. Z.—Two of your questions are business enquiries, and could not be definitely answered by us or our correspondents. Every maker will recommend his own goods, and prices vary considerably. Pay a fair price to a reputable manufacturer, and stick to him as long as he sends you the right thing.

AQUARIUM CEMENT.—R. C., of Ill., will find a good recipe on page 267 of our Volume XXV.

METAL LINING IN CAST IRON BOXES.—Let W. A., query 12, on page 416 of Vol. XXVI., drill a few holes at an angle on the inside of his boxes, partially through the metal. The melted Babbitt metal will run into these boles, forming lugs which will effectually keep the metal in place and be tight until worn out.—S. G. S., of N. Y.

TAKING IMPRESSIONS ON PAPER.—Query 19, page 10.—Impressions can be taken by coating a piece of thick paper with oil and olding t over the flame of a candle or lamp until it is smoked black. Any kind of oil will answer, though linseed is the best; little oil should be used.—E. E. S., of O.

FORCE OF FALLING BODIES.—In view of the difference between the two answers to J. E., query 12, June 8, and of my own ideas, somewhat different from either, I would say: The striking force of a moving body, in whatever direction it moves, is its momentum. Its momentum is the joint result of its quantity of matter and its velocity. The ratio of this momentum to that of other moving bodies is compounded of the ratio of its quantity of matter, which is indicated by its weight, and of its velocity at the instant in question. Its momentum, therefore, is not weight any more than it is space or time, and it cannot be expressed by pounds, in the ordinary sense of that word, any more than by feet or by seconds, nor is it expressed by any two of those terms. To obtain a statement of the momentum of a body for the purpose of comparison: Multiply its weight by its velocity—its number of pounds, for instance, by the number of feet it would move in a second if it should proceed for a second at the rate for the instant in question. The velocity of a falling body is continually accelerated, and it increases not as the space fallen over but as the square root (query? ED.) of that space. Therefore to multiply the weight by the space fallen over will not give the momentum. The velocity of a falling body at the end of one second of its fall is 32 1-6 feet per second, and it has fallen one half that distance. It will fall 4 1-48 feet in half a second, and its velocity is then 8 1-24 feet in half a second. The velocity at four feet descent is nearly the same, but more exactly is 16·0312 feet per second. This multiplied by the weight in pounds gives the momentum. The general formula is: The square root of (64·33 multiplied by the distance fallen)=the velocity, and the velocity multiplied by the weight=the momentum. So much for determining the momentum. The extent of change produced by the blow of a hammer has a compound relation to the force of the blow and the ability of that which it strikes to resist. Some obstacles resist in proportion not only to intrinsic power, but also to the time during which they exert their resistance, and their resistance to a blow is less as the velocity of the blow is greater. Such are the different attractive, repulsive, and expansive forces, and such is substantially the case where springs are to be bent and where many forms of cohesion are to be overcome. In such cases, the change produced is as the weight multiplied by the square of the velocity, and in case of a falling body is as the weight multiplied by the distance fallen. Other resistances are independent of time, and are in proportion to the space over which the resistance operates. Such is substantially the case of friction. Here the change is as the momentum of the blow. It is so in the case of bodies resisted by the momentum or inertia of other bodies, or, as in greater or less degree is the case of a body moving through liquids, of the particles of bodies. The case of forging with a hammer presents a compound of both these kinds of resistance, varying in their proportions with the nature of materials, degree of heat, and other considerations.—G. M. T.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

ARGAND LAMP BURNER.—Joseph Ravoux, of New York city, assignor to himself and Lucien Knapp, of same place.—This invention relates to improvements in the construction and arrangement of lamp burners which are adapted for the reception of annular wicks, and has for its object to improve the flame by a more perfect system of admission of air. It consists in admitting air at the base of the flame of an argand burner by means of perforations in the concentric tubes which enclose the wick. The upper ends of the tubes are bent apart—the inner one inward and the outer one outward—to allow free passage to the air.

BIRD'S NEST.—John A. Deknatel, New York city.—This invention furnishes an improved wooden bird nest which is made in two pieces, each turned out of a single piece of wood, and japanned both inside and outside.

PAINTER'S PALETTE.—The improvement in this invention consists in adjustably attaching to the palette a clamp, by means of which it can be attached to any suitable fixture and thereby rendered more useful in sign and ornamental painting. It may be used without the clamp, in the usual manner. Oscar Le Roy Andrews, of Boston, Mass., is the inventor of this improvement.

CELL COVER FOR SEWING MACHINE TABLE.—George Alfred Wheeler, Worcester, Mass.—This invention consists in arranging a series of cells, in sewing machine or other tables, in a row, and providing them with sliding covers which adjoin and all slide in the same direction when being opened or closed. A spring acts on one end cover, and through that communicates motion to any or all of the others so as to close them.

AUTOMATIC BELL RINGING APPARATUS FOR LOCOMOTIVES.—James S. Lamar, Augusta, Ga.—This invention consists of a crank shaft which is mounted on the locomotive and provided with a friction wheel or a gear wheel in such a manner that it can be readily geared or ungeared with one of the axles. The bell is connected to the crank by a cord and is rung automatically when the locomotive is in motion; thus saving the labor of ringing it by hand, which is considerable in large towns where the distances along which the bell is required to be rung are long.

SAW GUIDE.—James Arthur, Anoka, Minn.—This invention produces a saw guide which can have its jaws adjusted while the saw is in operation without exposing the operator's hands to dangerous contact with it, and in which, furthermore, either jaw can be adjusted independently of the other.

WHEEL PLOW.—Guy Tozer, Jackson, Mo.—This invention furnishes an improved plow which is designed more particularly for tight clay soils, but which may be used with advantage in other soils. It is so constructed as to open the bottom of the furrow so as to drain off surplus water from the roots of the grain and prevent them being chilled by it in cold weather or scalded in warm.

ROTARY STEAM ENGINE.—George H. Whitcher, South Brooklyn, N.Y.—This invention furnishes an improved steam engine, which is so constructed as to give a constant and steady motion, and which may also be used as a pump, if desired; it consists in combining two steam cylinders with two other smaller cylinders eccentrically shafted within them, and a horizontal piston. The construction, which would not be understood from a verbal explanation alone, insures the rotation of the inner cylinders and their shafts when steam is admitted.

PORTABLE HOUSE.—Harvey W. Forman, Centralia, Kan.—The invention relates to an improvement in that class of house whose parts are detachable, in order to admit of being packed and transported conveniently and cheaply from one place to another. It consists in a new arrangement of parts with a view to increased lightness, strength and durability of the structure.

HATCHWAY GUARDS.—Edward H. Ball, of New York city.—This invention furnishes an improved guard for elevator and other hatchways which is so constructed as to be raised by weights automatically into position as the hatch is opened. When shut down, it is secured in place by a spring bolt which is released by the rising hatch.

LIFTING JACK.—Charles Maynard, of North Topeka, Kas.—The object of this invention is to render more useful and effective the ordinary lifting jack for wagons and other wheeled vehicles; and it consists in connecting the parts so as to cheapen, simplify, and improve the construction without involving any material alteration in form.

HEDDLE CONNECTION FOR LOOMS.—Thomas K. McIntyre, of Warner, N. H.—In this invention, metal straps are used for connecting the various parts of looms instead of the ordinary leather ones. They are cheaper and more durable. The strap is made in two toothed pieces which are joined by a sleeve which is drawn over the parts where the teeth mesh. By this construction its length is easily adjustable.

MILK STRAINER.—Richard G. Kendall, of Fairweather, Ill.—This invention relates to a useful improvement in milk straining buckets or pails, and consists in a new mode of making the strainers detachable from the bucket, so that they may be changed or removed with facility. The strainers are made with a grooved frame which slides on to lips on the spout of the bucket.

FENCE.—Israel L. Landis, Lancaster, Pa.—This invention is an improvement on a fence patented by S. H. Rose, September 25, 1866, and it consists in combining, with the pins that pass horizontally through the posts and support the panels in an upright position, other pins that pass transversely through bottom strips of the panels and prevent the panels being raised by small stock in its effort to pass under the same.

FRUIT DRYER.—Judson Allen, of Everett, Mo.—In this improved dryer an air chamber is arranged below the drying chamber and above the heating chamber, which receives air from the sides of the case, and delivers it through its perforated vertical side walls to the drying chamber above, so as to prevent too much heat radiating through the bottom plate. At each corner of the dryer is a hot air conductor, which can be adjusted either to turn the heat into the dryer, or to allow it to escape through the top. On the front of each conductor are deflecting plates which cause an equal distribution of the heat in the drying chamber.

MEDICAL COMPOUND FOR HEART DISEASE.—Michael D. Britten, of Eaton, Mich.—This invention relates to a new and useful improvement in the curative art; and consists in a compound composed of the pitch of *pinus origide* beech bark and the heart of the iron-wood tree, all steeped in alcohol moderately for several hours.

FRUIT CRATE.—Elijah B. Georgia, Clifton Station, Va.—The invention consists in a fruit and vegetable crate consisting of top and bottom frame slatted and connected by slats nailed to their inner sides.

ADJUSTABLE STAND.—Matthews Stahn, Baltimore, Md.—This invention consists in a triangular stand for photographer's use, formed in two hollow sections, one of which is raised or lowered within the other by means of a windlass, and held by clamp screws.

WATER WHEEL.—John Frank, Chester, O.—The invention consists in adjusting a water wheel vertically by means of slotted uprights, a tenoned bridge tree, and an adjustable wedge support; in attaching the buckets by mortise and tenon to a central hub and then holding it by a single band and a bolt to each bucket; in giving a gradual curve, then a quick rise at the end, and then a relative hight and width to the buckets; and finally, in making the cup in sections, detachably held by cross rods on the inside and bands on the outside.

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CULTIVATOR.—Frederick W. Tolley, of Coxsackie, N. Y., assignor to himself and Albert V. D. Collier, of same place.—This invention furnishes an improved cultivator, which is so constructed that it may be conveniently transported from place to place. It is provided with wheels which stand a little above the surface of the ground when in working position, and by the aid of which it is moved over obstructions. The frame also admits of being turned over forward so as to rest on these wheels, in which position the cultivator can be drawn about with the same facility as a cart.

DRAFT REGULATOR.—Joseph Woodruff, of Rahway, N. J.—This invention relates to a new apparatus for regulating the draft of the furnace in accordance with the steam pressure of a boiler, so that the furnace heat is automatically reduced whenever the pressure exceeds a given degree, and is augmented when the pressure falls below a desired point. It consists in an arrangement of flexible diaphragms, connected with a vertical stem, which when adjusted up and down, by the action of steam on the diaphragms, causes vibrations in a weighted lever, and the consequent automatic adjustment of a damper which is connected with it.

BRAID GUIDE FOR SEWING MACHINE.—Eddy T. Thomas, of Boston, Mass.—This invention consists in the arrangement, within a sloping or diagonal slot in the presser foot, of a cylindrical guide-piece, which is provided with a circumferential V-shaped groove and adapted to be turned or rotated on its axis, so that the passage for the braid may be enlarged or contracted in width to accommodate wide or narrow braids.

ANIMAL TRAP.—George F. Lampkin, of Georgetown, Ky., assignor to himself and James Y. Kelley, of same place.—This invention furnishes an improved trap for catching rats and other animals, which is so constructed as to catch any number of animals without frightening the others, or leaving any scent in the trap to warn them of the danger.

BED BOTTOM.—Henry B. Ramsey, of Rockville, Ind., assignor to himself and Wells C. McCool, of Guthrie Center, Iowa.—This invention relates to a new arrangement of the supporting springs and cross bars of a bed bottom. The slats are, by screws or nails, firmly secured to the cross bars, and strips of leather or rubber are interposed between them to prevent wear and squeaking. To the middle of each cross bar is secured, at the under side, the middle of a supporting spring, the ends of which are free and project downwardly. The springs rest on the bedstead rails and are padded with rubber or leather. In order to strengthen the springs and give a more firm support to the cross bars, cushions of rubber, or spiral springs, are placed between.

GRATER.—Josiah A. Hard, of Lawrence, Kansas.—This invention relates to a new grater for nutmegs, horse radish, and other similar purposes; and consists in the use of a rotary grating cylinder contained within a stationary cylinder, and hung on a frame in such a manner that it can be withdrawn from the outer cylinder and detached from the frame whenever desired. See advertisement on another page.

RATCHET.—Thomas Searls, of Pottstown, Pa.—This invention furnishes an improved ratchet, which is so constructed that it may be readily adjusted to revolve the shaft in either direction, or to let the shaft stand still while the ratchet continues to work. It consists in a toothed wheel which is attached to the shaft, and two pawls which are placed on opposite sides of the wheel and turned in opposite directions. By the aid of springs and other appropriate mechanism, the pawls, or either of them, are made to engage with the wheel or not, as required.

BRICK MACHINE.—Henry Bulmer and Charles Sheppard, of Montreal, Canada.—This invention relates to an attachment to brick machines, by the operation of which the clay is pressed into the mold at suitable pressure and the molds, when filled, are pushed out from below the drum without manual labor. The machine may be worked by steam, water, or horse power, and will, with the same attendance, manufacture a greater number of bricks than the devices for the same purpose now in use.

MACHINE FOR THROATING SPOKES.—Joseph B. Stanley and Matthew D. Smith, of Tough Kenamon, Pa.—This invention relates to a new machine for throating the spokes of wagon or carriage wheels, facing the same, and tapering them toward the outer ends. It consists in the arrangement of an eccentric support for the spoke while in contact with the cutter, so that the cut may be tapering to make the spoke thinner on the face than at the back. The invention further combines various other details of improvement.

THILL COUPLING.—James T. Hards, of Geneva, Ill.—This invention furnishes an improved thill coupling which may be coupled and uncoupled without trouble. The clip and yoke of the coupling are constructed and attached to the axle in the ordinary manner. Upon the forward arm of the clip, above the end of the yoke, is formed a chamber having a rectangular hole formed through it to serve as a socket for the head of the thill iron. The front bar of the chamber is concaved upon its inner surface. The head of the thill iron is made convex upon its forward side when in working position, so as to fit into and rest against the concaved surface of the chamber and support the draft strain. The head of the thill iron is slotted transversely upon its rear side to receive a pin which passes through the side bars of the socket, and is riveted or otherwise secured to it. The pin serves as a hinge to the thill iron, and also to support the strain in holding back. By this construction the thill irons can be readily raised from the socket, but the coupling cannot become uncoupled when the thills are in any position in which they can possibly be while attached to a horse.

MITER BOX.—Andrew Clayton Hall, of Carbondale, Pa.—This invention relates to a new form of saw guides, and to a new combination of the same with the posts and swivel bar of a miter box, which greatly improves the general arrangement of the parts. It consists, first, in making the guides laterally adjustable on vertical slides, so that they can be fitted to any thickness of saw blades; and, second, in combining said guides and slides with two slotted posts, of which one constitutes the pivot of the horizontal bar to which the other is secured.

SAD IRON STAND.—George O. Ballou, of Fall River, Mass.—This invention consists of a sad iron stand made of metal or other suitable substance, the top of which is recessed so as to form a receptacle for an appropriate polishing composition; thereby forming a convenient and serviceable article for the laundress.

MACHINE FOR MAKING BARRELS.—William Brown, of St. Louis, Mo.—This invention relates to improvements in machines for crozing, chamfering, and leveling or trimming off the ends of the staves of barrels; and it consists in a hollow shaft which carries a radially grooved disk, in the grooves of which the sliding tool stocks are mounted, and a second shaft which works within the first and carries a cam arrangement for giving radial motion to the tool stocks. The latter is geared to the wheel that drives the hollow shaft by a wheel having a different number of teeth, so that the speed of the two are unequal. In this way the first shaft operates the tools and the second moves them to or away from their work, so that they may be easily inserted in or drawn out from the barrel. The machine is provided with a sliding table which carries the tools, and a ring in which the barrel is held.

STEAM BOILER.—James N. Paxman and Henry M. Davy, of Colchester, England.—In this invention an annular vertical boiler surrounds its fire box and vertical flue; and bent water tubes are placed in the fire box, which connect at their lower ends with the sides of the annulus and at the upper with the crown sheet. The improvement in these tubes consists in making them taper or contracted at their lower bent ends, where the colder water enters, so as to impart a scouring action to the current and prevent incrustation. They may also be provided with ribbed plugs so as to further lessen the passage and increase the effect. Deflectors are placed in their upper ends to direct the water laterally and downward, and various other improvements are made in the boiler generally.

CURTAIN FIXTURE.—Stewart Hartshorn, of New York city.—The object of this invention is to simplify, cheapen, and improve the stop motion of spring curtain fixtures, and it consists in attaching to one end of the roller a cap, or case, in which are placed several loose pawls, so arranged and of such form as to fall against and engage with recesses in the spindle of the roller by their own gravity. When quick motion is given to the roller, either in letting up or pulling down the curtain, centrifugal force throws the pawls outward from the spindle, but upon slackening the motion one or the other of them drops and stops the curtain.

STEREOTYPE BLOCK.—Robert P. Tickle, of London, England, assignor to George Holt Mason, of same place.—This invention relates to an improved means of mounting and securing stereotype and other plates in a printing press, whereby a great saving of time and labor is effected, inasmuch as the the use of the ordinary chases, leads, and other pieces, technically called furniture, is dispensed with. It consists in providing the bed with parallel oblique bars which are of T form in cross section, and to which are attached the plates by screw clips and nuts, or their equivalents.

SOLDERING ROD.—William M. Neill, of Bridgeport, Conn., assignor to himself and S. D. Roberts, of New York city.—This invention relates to soldering tin roofs more especially, but is adapted to other purposes. Tin roofs are generally soldered with resin and solder separate, and the resin frequently becomes displaced by jarring, or is blown away by the wind. These difficulties are overcome by making a tube of the solder and filling the same with resin, or by combining the resin with a rod of solder, in such a manner that both are applied at one time and in proper proportions.

CHAIR.—Randolph S. Mains, of New York city.—This invention consists in an adjustable chair of very ingenious construction which can hardly be explained verbally. It admits of being made to assume seventeen or more different forms, and of being put to nearly as many different uses. From the simple chair, it can be converted into several forms of easy and invalid chairs and sofas, and parts of the apparatus are so contrived as to act as tables, reading desks, etc., in combination therewith.

THILL COUPLING.—John H. Morgan, of Lebanon, Ind.—This invention furnishes an improved coupling for thills or shafts, tongues, etc., which is so constructed that, while coupling the thills or tongue securely, it may be easily and quickly uncoupled. A yoke, the forward end of which consists of two projecting lugs, is fastened by clips to the axle. The lugs have inclined slots formed in them, extending downward and forward from their upper edges, to receive a bolt which is attached to eyes formed upon the rear ends of the branches of the thill iron. The forward parts of the thill iron are secured to the rear end of the thill, and the rear parts are branched to receive the lugs between them. By this construction the bolt can be readily passed into and out of the inclined slots in the lugs. The fastening or unfastening is effected by means of a hook which is pivoted between the lugs and which falls over the bolt so as to hold it securely in place.

DOUGHNUT CUTTER.—John F. Blondel, of Thomaston, Me.—This invention furnishes an improved device for removing the dough from the cutter tube automatically; it consists in the combination of a spring and follower with the center tube in such a manner that the spring is compressed when the dough is cut, and the dough in the tube pushed out by the recoil of the spring.

PAPER PULP MACHINE.—John M. Burghardt, of Great Barrington, and Frederick Burghardt, of Curtisville, Mass.—The object of this invention is to provide improved means for reducing wood to pulp for the manufacture of paper; and it consists more particularly of a revolving grinding emery wheel which is hung on a horizontal shaft and surrounded by a curb or casing. The casing is provided with apertures on each side of the grinding wheel to admit the wooden blocks which are to be reduced, and which are automatically fed up to the wheel by an ingenious arrangement of mechanism.

IRONING BOARD.—Leander N. Vallett, of Providence, R. I.—This invention relates to a new device for fastening ironing boards to walls or upright standards and for bracing them, so that they will be securely held in place. It consists in a new form of sockets on the end of the board, and in their combination with hooks on the wall for entering the sockets; and also in a novel arrangement of ears under the board for receiving the projecting tenons of the supporting brace.

HARVESTER DROPPER.—Richard A. Roberts, of Salisbury, Mo.—This invention furnishes an improved side dropper for harvesters, which is simple in construction, light, and not liable to get out of order; it drops the grain in gavels at the side of the machine, so as to be entirely out of the way when making the next round.

BRIDLE BIT.—James Burns, of East Topham, Vt.—The object of this invention is to provide means for rendering the common bridle bit effective for controlling restive, vicious, and runaway horses, and it consists in attaching to one or both of the parts of the bit one or more lugs or staples, which bear against the roots of the tongue or other sensitive part of the mouth when the reins are drawn.

CIGAR MACHINE.—Webster H. Pease, of Fulton, Wis.—This invention relates to a new machine which prepares the tobacco to be used as a filler for cigars by rolling it into shape and binding and cutting it with great rapidity. It consists in a new arrangement with rotary knives for cutting the filler leaves into strips; of grooved rollers for collecting them into cylindrical form, and of a winding wheel for tying the filler with string or applying a wrapper. It also consists in the combination, with the foregoing, of an endless apron on which the filler leaves are fed along in the desired manner, and in the arrangement of rotary cutters for cutting the completed cigars or fillers in proper lengths.

MATTRESS AND CUSHION TACKER.—Thomas A. Watson and Alfred H. Phillips, of Brenham, Texas.—This invention was alluded to in our article describing the mattress stuffer invented by the same parties, at page 350, Vol. XXVI. It is an apparatus for finishing the mattress after it leaves the stuffer, and consists in a simple arrangement of a slotted sliding table (on which the mattress is laid) and gangs of needles which are made to pass through the mattress and the slots. The needles are then threaded in eyes near their points, and upon and by their withdrawal the tacking and stuffing is accomplished.

RAILWAY CAR TRUCK.—Jose S. Camacho, of Habana, Cuba.—This invention has for its object to insure the proper position of wheels of railroad cars while running on curves, and consists in the arrangement of a swivel frame holding two pairs of wheels in such a manner that each wheel can turn independently of the others.

TRACTION ENGINE.—Louis A. Herrmann, of Paris, France.—The principal feature in this invention consists in propelling the engine by four legs and feet, which are made to move, two and two, in the manner of a four footed animal, They are worked by steam power, and are compelled to sustain the weight of the engine in making the steps so as to cause the necessary adhesion of the foot to the ground. The invention is very comprehensive and includes all the parts necessary to a highly efficient and manageable traction engine.

HAT SHADE.—Marcus L. Battle, of Bainbridge, Georgia.—This invention relates to an improvement in shades designed to form extensions of the brim of a hat. The shade is made of linen, or any other suitable material, and is kept distended by a circular steel hoop secured in its outer edge. It is made double, the upper part having a central aperture to receive the crown of the hat, and the lower part being made with a somewhat larger opening. An elastic cord is secured to each part around its inner edge and thus the tension of these, as opposed to the hoop, keeps the shade distended so as to be flat and smooth. The cord in the upper part serves also to keep the shade in position by embracing the crown of the hat.

LEGS FOR TABLES AND STANDS.—George H. Bell, of New York city.—This invention relates to a new construction of the bent legs used for the support of tables, chairs, etc. The leg is made of several layers of veneer glued together, and is bent to the requisite form and carved or ornamented in a suitable manner, Thus made, the legs are very strong and durable, the glued veneers holding shape far better than single pieces.

SPEAKING TUBE ANNUNCIATOR.—Robert May, New York city.—This invention relates to an improved mechanism, which, when connected with a speaking tube, constitutes an index and an annunciator to call an attendant and show at which tube response is required. It consists in combining a drop ball or swinging plate, which is set in motion by air blown through the speaking tube, with a balanced lever, which latter serves to establish, when moved by the displacement of said ball or plate, an electric circuit by means of which the annunciator is actuated.

PILE REMEDY.—Lizzie E. Brady, Gatesville, N. C., assignor to herself, John Brady, and Annesia Langstun, same place.—This invention provides a medical compound for the cure of the disease named, composed of one fourth of an ounce of tincture of opium to three fourths of an ounce of water and half an ounce of pure gum arabic.

Practical Hints to Inventors.

MUNN & CO., Publishers of the SCIENTIFIC AMERICAN have devoted the past twenty-five years to the procuring of Letter Patent in this and foreign countries. More than 50,000 inventors have availed themselves of their services in procuring patents, and many millions of dollars have accrued to the patentees whose specifications and claims they have prepared. No discrimination against foreigners; subjects of all countries obtain patents on the same terms as citizens.

How Can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them; they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible and send by mail. An answer as to the prospect of a patent will be received, usually by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention, if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co., 37 Park Row, New York.

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A reissue is granted to the original patentee, his heirs, or the assignees of the entire interest, when, by reason of an insufficient or defective specification, the original patent is invalid, provided the error has arisen from inadvertence, accident, or mistake without any fraudulent or deceptive intention.

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A patent for a design may be granted to any person, whether citizen or alien, for any new and original design for a manufacture, bust, statue, alto-relievo, or bas relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics; any new and original impression, ornament, pattern, print, or picture, to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture.

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5,980.—SPICE CASTER.—G. S. Adams, New York city.
5,981.—NETTED FABRICS.—W. Dexter, Brooklyn, N. Y.
5,982.—TYPE.—C. C. Hine, Newark, N. J.
5,983.—RUBBER MAT.—L. L. Hyatt, New Brunswick, N. J.
5,984.—TYPE.—A. Little, New York city.
5,985.—SODA WATER APPARATUS.—G. F. Meacham, Newton, Mass.

TRADE MARKS REGISTERED.

890.—EMERY.—Baeder, Adamson & Co., Philadelphia, Pa.
891.—COFFEE, SPICES, ETC.—Chase & Co., Buffalo, N. Y.
892.—CORN MILLS.—H. D. Coleman, New Orleans, La.
893.—MEDICINE.—W. B. Douglass & Co., Washington, D. C.
894.—HAMS.—Evans, Lippincott & Cunningham, Cincinnati, O.
895.—FLOUR.—Farber, McPike & Co., Alton, Ill.
896.—MEDICINE.—J. and C. Maguire, St. Louis, Mo.
897.—SHIRTS.—Marley & Cook, Newark, N. J.
898.—BITTERS.—J. Niederlander & Co., Columbus, O.
899.—GINGER TONIC BITTERS.—W. M. Tileston, New York city.
900.—CIGARS.—E. W. Woodbury, New York city.

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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

16,814.—CIRCULAR SAW MACHINE.—C. P. S. Wardwell. Sept. 25, 1872.
21,734.—WATER CLOSET.—F. H. Bartholomew. Sept. 25, 1872.
21,762.—KNITTING MACHINE.—J. K. and E. E. Kilbourn. Sept. 25, 1872.
21,798.—SPELLING BLOCKS.—S. L. Hill. September 25, 1872.
21,846.—PLOW.—W. Reaney. October 2, 1872.

EXTENSIONS GRANTED.

20,960.—BOOT HEEL SHAVER.—V. Snell.
20,970.—ELECTROMAGNETIC ALARM.—W. Whiting.
21,026.—CAR COUPLING.—B. E. Sampson.

EXTENSION REFUSED.

20,865.—ROCKING CHAIR.—I. P. Carrier.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

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FOREIGN PATENTS---A HINT TO PATENTEES.

It is generally much better to apply for foreign patents simultaneous with the application in the United States. If this cannot be conveniently done, as little time as possible should be lost after the patent is issued, as the laws in some foreign countries allow patents to any who first make the application, and in this way many inventors are deprived of valid patents for their own inventions. It should also be borne in mind that a patent is issued in England to the first *introducer*, without regard to the rights of the *real* inventor; therefore, it is important that all applications should be entrusted to responsible agents in this country, who can assure parties that their valuable inventions will not be misappropriated. The population of Great Britain is 31,000,000; of France, 40,000,000; Belgium, 5,000,000; Austria, 38,000,000; Prussia, 25,000,000; German Confederation, 40,000,000; Canada, 4,000,000: and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address

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The new patent law in Canada permits Americans to take patents there on favorable terms.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]
From July 6 to July 11, 1872, inclusive.

BEATING CARPETS.—A. A. Schlesinger, San Francisco, Cal.
BLOWPIPE, ETC.—J. Cook (of New York city), Liverpool, England.
CARPET PAD.—E. H. Bailey, Brooklyn, N. Y.
COTTON TIE.—J. E. Aiken, New Orleans, La., C. Swett, Copiah, Miss.
FIRE EXTINGUISHER.—J. J. Walton, Newark, N. J.
PAVEMENT.—C. W. M. Smith, San Francisco, Cal.
PRINTING TELEGRAPH.—M. F. Wessman, Brooklyn, N. Y.
PRINTING TELEGRAPH.—R. H. Gallaher, New York city.
PRINTING TELEGRAPH.—R. H. Gallaher, New York city.
SHIRT.—O. H. Keep, New York city.
STANDING RIGGING.—H. E. Townsend (of Boston, Mass.), London, England.
WELDING ALLOYS.—G. R. Meneely, West Troy, N. Y.

NEW PATENT LAW IN CANADA.

By the terms of the new patent law of Canada (taking effect September 1st, 1872) patents are to be granted in Canada to American citizens on the most favorable terms.

The patent may be taken out either for five years (government fee $20), or for ten years (government fee $40) or for fifteen years (government fee $60) The five and ten year patents may be extended to the term of fifteen years. The formalities for extension are simple and not expensive.

In order to apply for a patent in Canada, the applicant must furnish a model, specification and duplicate drawings, substantially the same as in applying for an American patent.

American inventions, even if already patented in this country, can be patented in Canada provided the American patent is not more than one year old.

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NEW BOOKS AND PUBLICATIONS.

THE ALDINE. James Sutton & Co. Publishers, 23 Liberty Street, New York. Subscription $5.00 a year, with oil chromo.

As usual, the *Aldine* is repletes with admirable engravings and light graceful literature. The August number has, for a frontispiece, a "Winter Sketch," by George H. Smillie, exquisitely designed and engraved; and there are contributions from Julian Hawthorne, E. C. Stedman, and others.

NATURE'S LAWS IN HUMAN LIFE. Boston: William White & Co. 308 pp. 8vo. Price $1.50. By the Author of the "Vital Magnetic Cure."

This is an exposition of Spiritualism, containing the various opinions of extremists, *pro* and *con*, together with the personal experiences of the author.

THE ECLECTIC MAGAZINE. New York: E. R. Pelton, Publisher. $5.00 a year.

The August number opens with a handsome steel portrait of George William Curtis, and presents its unusual excellent table of contents, mainly derived from the English periodicals.

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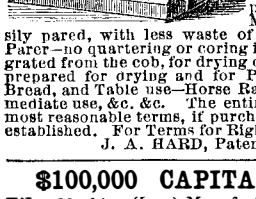

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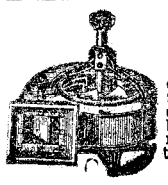

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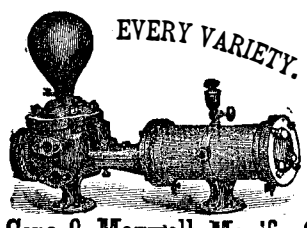

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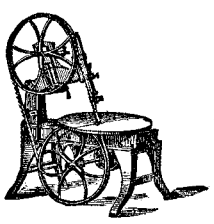

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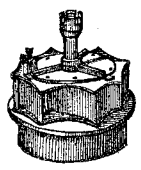

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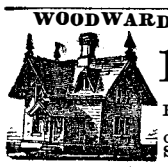

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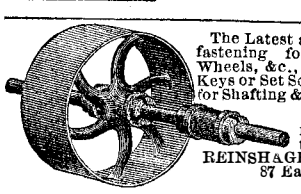

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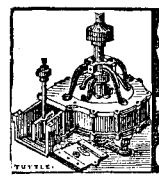

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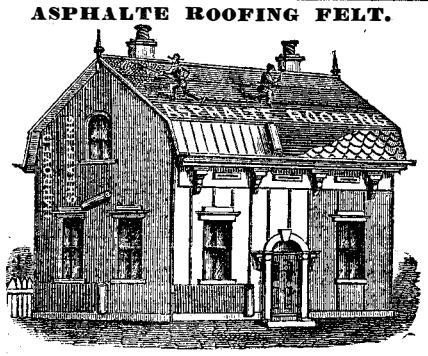

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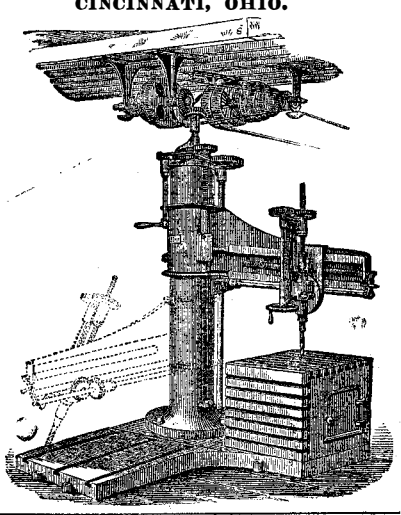

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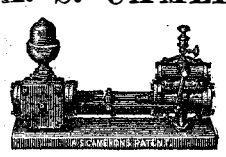

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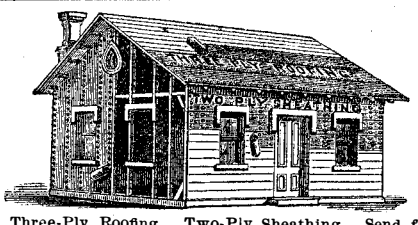

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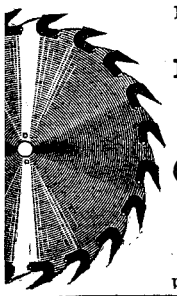

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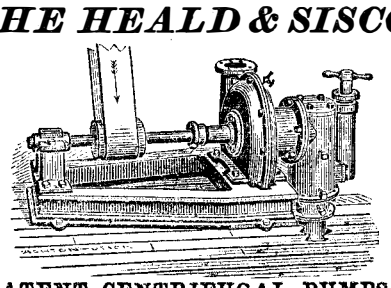

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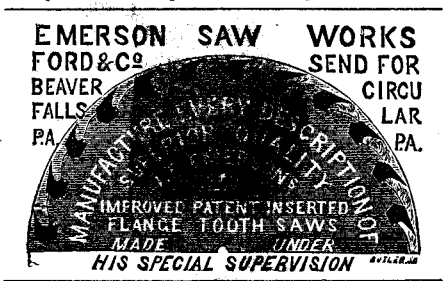

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